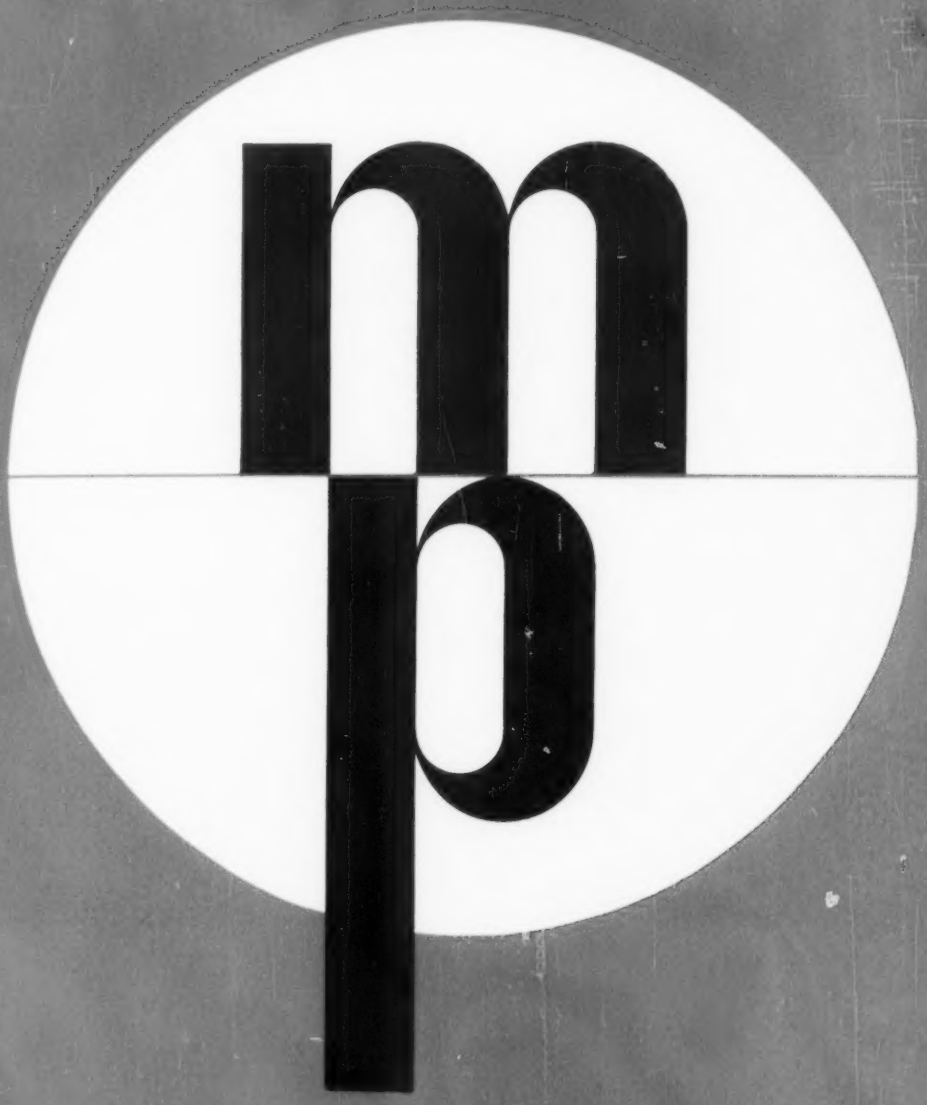
# MODERN PLASTICS



August 1957


*page 81* **The truth about reinforced plastics swimming pools**

*page 111* **New spiral flow test predicts material flow in the mold**

# geared to invade new fields

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## glass-fiber-filled **PHENOLIC**

Here is a single-stage, high-impact molding compound that opens new territory to the profitable application of phenolics.

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*Eldon Manufacturing Company, Los Angeles 1, Calif.

Catalin

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**Catalin also produces a wide range of urea, phenolic, cresylic, resorcinol and melamine resin formulations. Modifications of these are available.**

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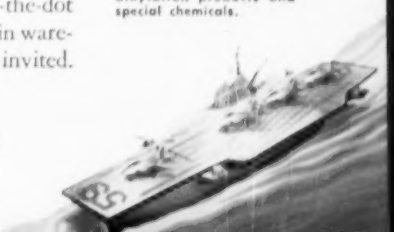

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MODERN PLASTICS*


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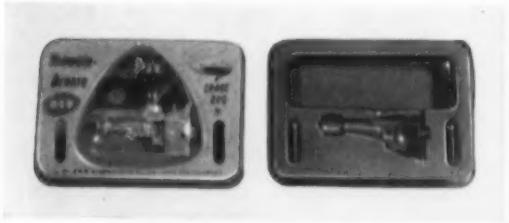

*These packages manufactured by Plastic Container Div. of Plastofilm Inc., Wheaton, Ill.

# Editorial

## Public frustration

On page 176 in "The Platform" section of this issue of MODERN PLASTICS appears an amusingly written letter from a New England farmer describing his trials and tribulations in connection with a do-it-yourself project.

All this man wanted to do was to keep up with his times by using plastic film in the construction of a simple cold frame for his garden.

While the letter is most amusing, the facts behind it are not. This case, in which several companies in the plastics industry literally wasted at least one thousand dollars of time and effort over a period of months in a futile attempt to supply the man with film, adhesive, and instruction, can be multiplied by uncounted similar examples.

It is to the credit of the public relations and advertising executives of the plastics industry that plastics product publicity is potent enough to stimulate action on the part of would-be consumers. But when that publicity and promotion is not backed up with a proper distribution system and a proper instructional operation, a demand is created which cannot be satisfied . . . and the net result is public frustration. It is a simple step from frustration to vigorous animosity.

A sad corollary to this situation is the fact that animosity created in any way to any plastic or to any plastic enterprise is rapidly reflected to the detriment of all plastics and plastics industries. When three years ago public frustration with badly designed and poorly constructed plastics toys turned into animosity, the sales of plastics housewares and other plastics products were adversely affected. In the field of agriculture and in the building field, unless the plastics industries are prepared immediately to back up their demand-creating publicity with distribution and instruction in depth, public frustration is likely to prove mighty costly for several years to come.

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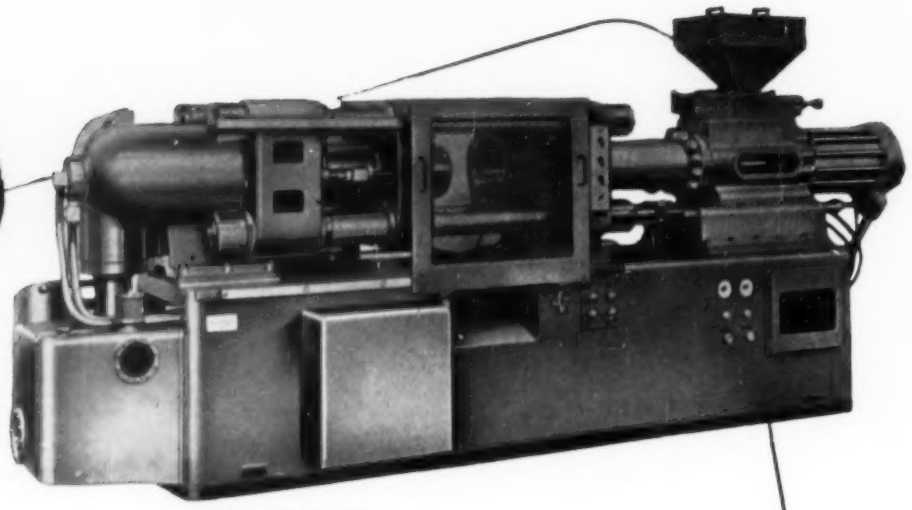

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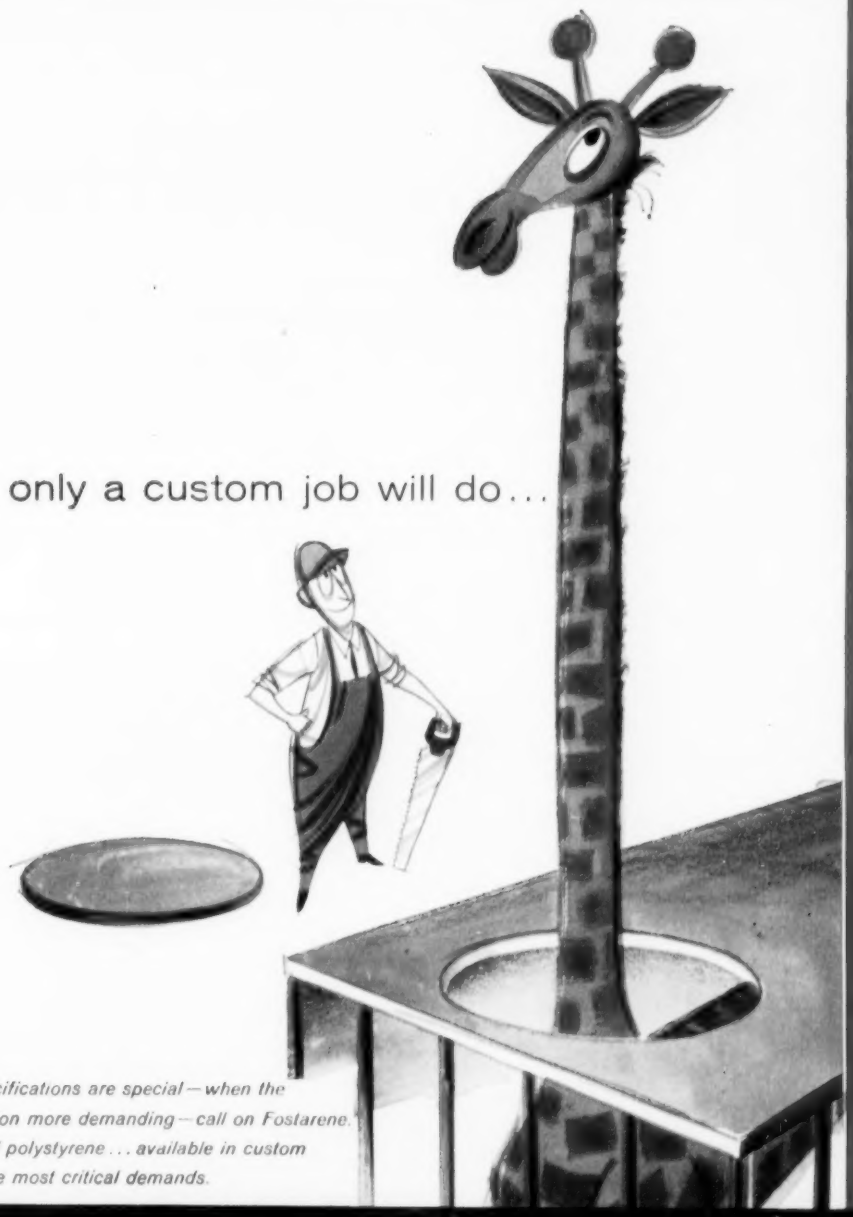
sometimes only a custom job will do...



*When the needs and specifications are special—when the product design and function more demanding—call on Fostarene. Fostarene is an advanced polystyrene... available in custom formulations that meet the most critical demands.*

# FOSTARENE *styrene plastics*

## *general-purpose • high impact • high flow*

*Available in pellets, granules and fine grind for dry coloring ... in crystal clear and a full range of custom colors.*

FG

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MANUFACTURED BY: FOSTER GRANT CO., INC., PETROCHEMICAL DIVISION
MONOMER PLANT, BATON ROUGE, LA. • POLYMERIZATION PLANT, LEOMINSTER, MASS.
A PIONEER IN PLASTICS FOR OVER THIRTY YEARS

# It's the hottest thing

Photo courtesy Blackman Plastics Company, Culver City, California  Fireban—T. M. Charles Crowl Company, El Monte, California

# in flame-resistance

They call it Fireban. And it's the latest answer to the need for an improved, flame-resistant, stress-relieved, thermoplastic sheet for aircraft, automotive and industrial applications.

Fireban is a totally different rigid sheet. Using a different approach in pigments and flame suppressants, it is translucent and considerably lighter in weight than similar materials. It also exhibits greater impact resistance plus high tensile strength and a high heat-distortion point. Yet it is readily formed and mechanically worked by any conventional method.

Because of its unusual physical and processing properties, Fireban has many uses, especially in the transportation field. Some of these include window frames (pictured at left), wall panels and seating for aircraft and trains; kick panels for cars, liners for refrigerated trucks plus instrument housings and other interior parts for all types of vehicles.

The exact composition of this new kind of plastic sheet has not been disclosed by the manufacturer, but it has been described as a unique alloy of vinyl and styrene resins. It also has been revealed that PLIOVIC is the vinyl resin used.

PLIOVIC was chosen because of its uniformity, rapid processing, and the superior physical properties it imparted to the end product. Another factor in its selection was the outstanding assistance rendered by representatives of the Goodyear Chemical Division.

Flame-resistant sheet is just one of many uses for the several types of PLIOVIC currently available. Wherever you need a high-quality vinyl resin, be sure to sample PLIOVIC and the service that goes with it. You can start today by writing for details plus the latest *Tech Book Bulletins* to: Goodyear, Chemical Division, Akron 16, Ohio.

PLASTICS DEPARTMENT

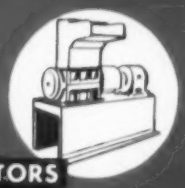
CHEMICAL GOODYEAR DIVISION

CHEMIGUM • PLIOFLEX • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS

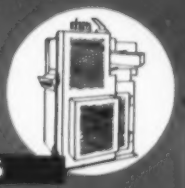
High Polymer Resins, Rubbers, Latices and Related Chemicals for the Process Industries

Chemigum, Plioflex, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

# In Plastics Reducing Machinery, Look to CUMBERLAND for the COMPLETE LINE



GRANULATORS



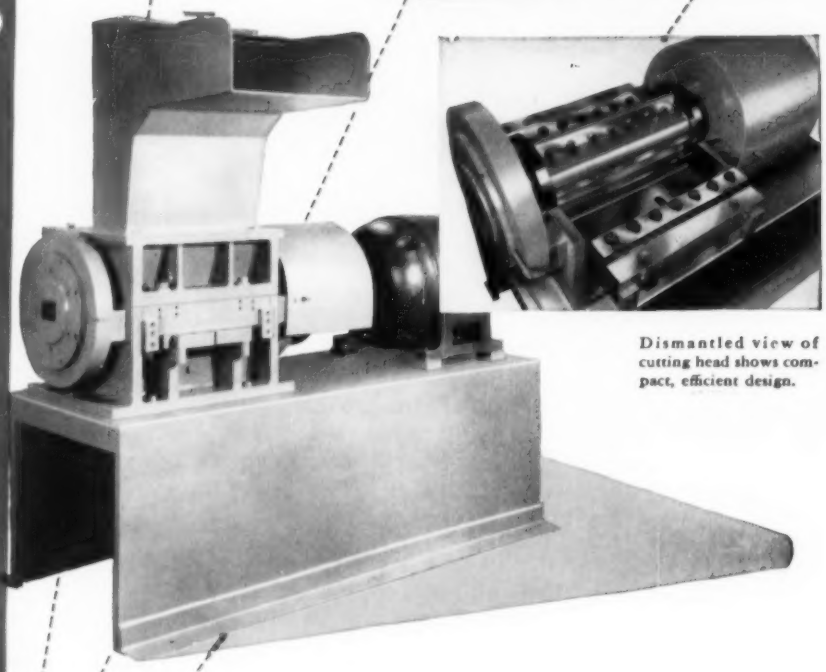
DICERS

CHOPPERS

PREBREAKERS

## MODEL 20 All Steel Granulator

CUSTOM ENGINEERED QUALITY BUILT



Dismantled view of cutting head shows compact, efficient design.

**1 HEAVY DUTY** — Large flywheel—thick all-steel weldments—deep welds—parts are of flawless wrought steel (not steel castings)—machine resists wreckage.

**2 LARGE THROAT OPENING** — 8 by 20" size.

**3 PRIOR BANDSAWING NOT NEEDED** — Machine specially built to handle large chunky parts such as bleeder scrap, cylinder purgings and heavy cast slabs of polystyrene, modified polystyrene and acrylic resins.

CUMBERLAND Engineering Company Inc.

BUILDERS OF BETTER MACHINES FOR THE PLASTICS INDUSTRY

DEPT. 80-16 · PROVIDENCE · RHODE ISLAND

California Representative:
WEST COAST PLASTICS DISTRIBUTORS, INC.
4113 West Jefferson Blvd., Los Angeles 16, Cal.

# now epoxy molded parts

Kurz-Kasch announces an important development; the ability to *mold* epoxy parts — in intricate shapes, with inserts — in large production quantities, with molding cycles and economy comparable to conventional thermosetting materials.

The material is molded by techniques developed by Kurz-Kasch from resinous materials supplied by Booty Resineers Inc., Newark, Ohio.

It is no longer necessary to limit yourself to casting procedures to get the benefits of epoxy. Molding cycles are relatively fast; production costs are therefore low. Tooling costs are comparable to other high-pressure plastics.

These parts have exceptional toughness, ability to hold inserts, resistance to moisture and most chemicals, and excellent insulating properties. Call your nearby Kurz-Kasch representative for quotes on parts molded of this material to your specs. Kurz-Kasch, Inc., 1415 South Broadway, Dayton 1, Ohio.

**kurz-kasch**

SALES OFFICES—New York, Mt. Vernon, Mo 4-4866; Rochester, Hillside 0626; Beverly, Mass., Walker 2-0065; Chicago, Merrimac 7-1830; Detroit, Jordan 6-0743; Philadelphia, Hilltop 6-6472; Dallas, Lakeside 6-5233; San Gabriel, Cal., Atlantic 7-9633; St. Louis, Parkview 5-9577; Atlanta, Cedar 7-5516; Toronto, Can., Oliver 7986

## For Precision Molded Nylon Gearing

## ------ *Quinn-Berry* of course!

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Phone: Hillside 5-0626

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Room 211
6349 Northwestern Ave.
Ambassador 2-6005

**KNOXVILLE, TENNESSEE**
Harold Malloy
7028 Rockingham Drive
Phone 8-5155

Unusual applications of precision molded nylon are routine projects at Quinn-Berry . . . gearing for a multitude of appliance, automotive and aviation components. The nylon gear shown above is molded directly onto the shaft to finish dimensions in one operation. Five separate operations were formerly necessary. The result? A 50% cost reduction and improved performance. Nylon gears by Quinn-Berry require no lubrication. They are quiet in operation . . . known to last 20 times longer than gears of other materials in many applications . . . have exceptional ability to withstand vibration.

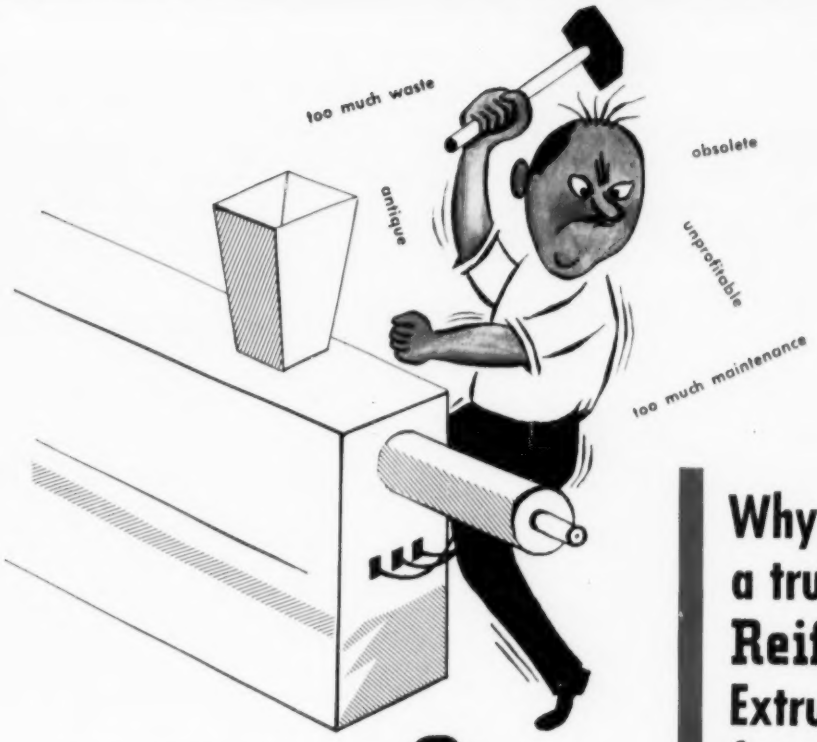
Quinn-Berry is a pioneer in the precision molding of nylon as well as other thermoplastic materials. For your component parts, put it up to Q-B where the "Unusual is Routine."

*WE FLY TO SERVE YOU FASTER!*

**QUINN-BERRY CORP.**

**2609 WEST 12TH STREET, ERIE, PA.**

MOLDERS OF ALL TYPES OF THERMOPLASTICS




B O P P

# Why not a truly modern Reifenhäuser-Extruder from the start . . . ?

. . . . . not only extruders are modern and automatic in operation, but also take-off units and auxiliary equipment. All offer high hourly output and a first-class product plus dependable performance.

For these reasons REIFENHAUSER installations assure profitable operations at all times.

The extruder illustrated above has a screw of 3½" diameter. Equipped with proper take-off units it will produce all types of cable coverings, film, piping, tubing, sheeting, blown films, profiles, etc. In addition to the 3½" extruder, REIFENHAUSER builds extruders with 1¼", 2½" and 6" diameter screws. Why not entrust REIFENHAUSER with your problems in extruding thermoplastic materials.

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**MASCHINENFABRIK**

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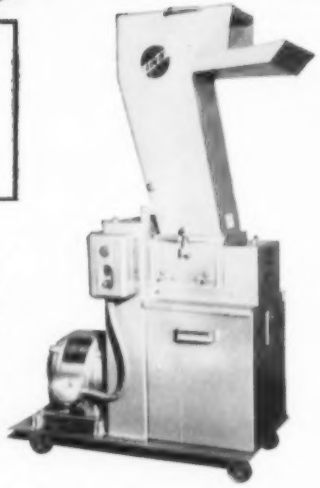
Apartado 3850, Caracas

# INJECTION MOLDERS!

# BOOST PRODUCTION!

## M-3 IMS M-4 GRANULATORS

*All machines illustrated here in stock for prompt delivery.*



The IMS M-3 6½" x 7" throat sprue grinder — rugged — simple in design — easiest to clean — built-in throat clearance bar — casters — catch pan.

**PRICE: Complete with 1 HP Motor and Starter .....$598.50**

The IMS M-4 5⅜" x 8½" throat grinder — designed primarily for vinyl, polyethylene, plastisols and all elastomerics where a fine-free low bulk factor product is desired — large throat for large injection molded parts.

**PRICE: Complete with 2 HP Motor and Starter $788.50**
**Same, but with 3 HP Motor $854.00**

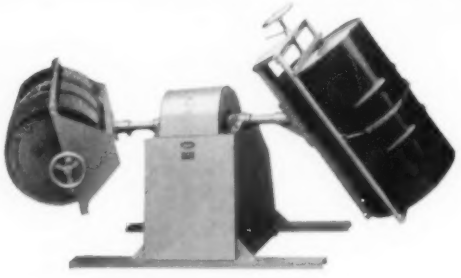
## CONSTANT MOLD TEMPERATURE REGULATOR

The IMS Economy Circulator — **priced at only $369.50 complete (oil model for heats to 450° at $482.50)** — duplicates performance of mold heaters costing up to 6 times as much — developed by a molder for molders — compact — portable only 15" x 22½" floor space.

**NOTE: Special price for 2 units ..... $349.50 Each**

## IMS DRUM TUMBLERS

**FOR ALL COLORING AND MIXING OPERATIONS**



All IMS Drum Tumblers are based on design suggestions of the leading material and colorant suppliers. Available for immediate shipment from stock.

**¾ HP Model** ..... **$595.00**
(Takes drums up to 33" high x 22" in diam.)
**2 HP Model** ..... **$897.50**
(Takes drums up to 37" high x 23¼" in diam.)
**3 HP Model** ..... **$1285.00**
(Takes drums up to 45" high x 24" in diam.)

**Send for our 1957 Nozzle Catalog and Heater Band Book Today. You'll find all styles of nozzles and heater bands fully described and priced, with technical notes on nylon molding.**

**Prompt service on all kinds of nozzles by the world's largest and most experienced nozzle specialists.**

## INJECTION MOLDERS SUPPLY CO.

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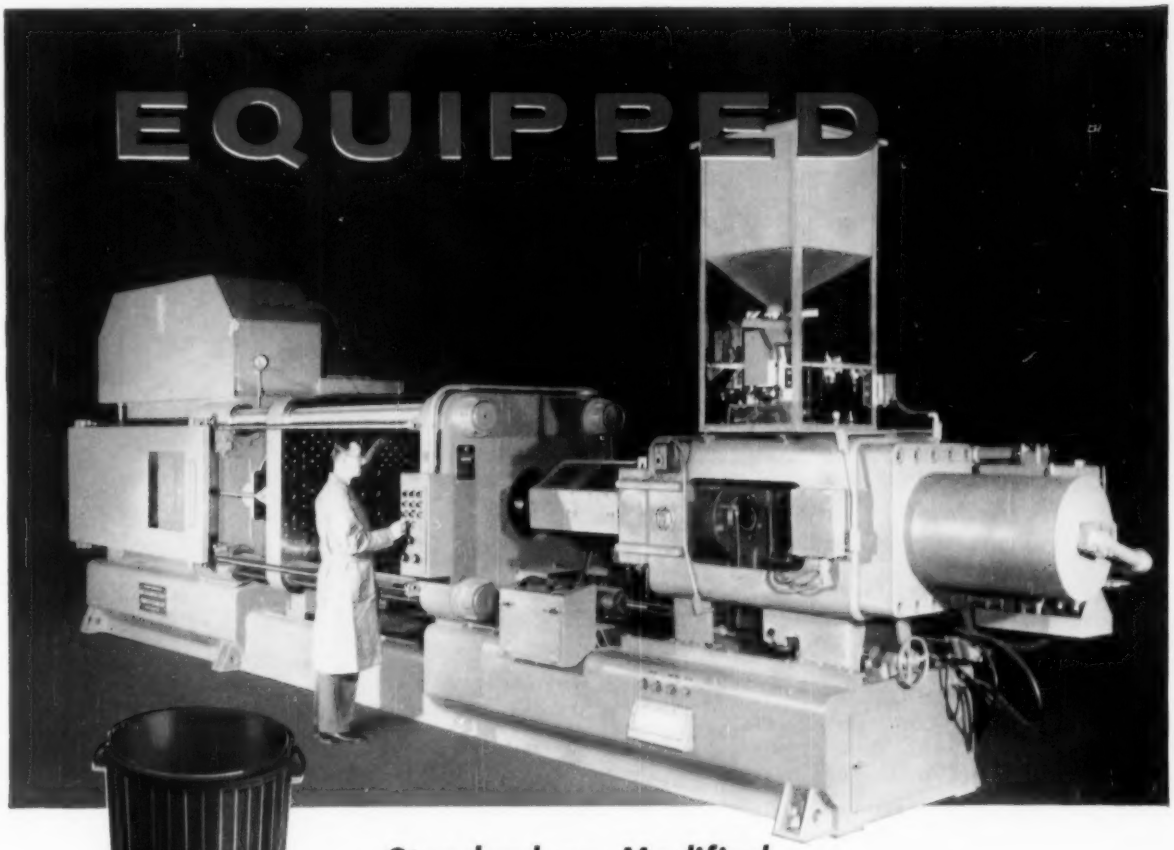


Special H-P-M 48/64 oz. injection machine with 84" daylight and 54" stroke. Ideal for deep parts like the LOMA 20½" tall waste basket above.

## *Standard or Modified,*
## **H-P-M** *Can Handle Your Needs*

H-P-M has a complete range of standard injection machines for normal requirements. For those jobs needing special equipment, here's what we can do for you:

- **Furnish standard machines with additional stroke and daylight.**
- **Special heating chambers for higher or lower injection pressures.**
- **Higher speed injection for special molding jobs.**
- **Furnish special electrical controls.**
- **Design special automatic cycle features.**

H-P-M, as one of the pioneers, has been building molding machines since the Plastics Industry was in its infancy . . . for 80 years we have been manufacturing all types of special hydraulic machinery. We have the technical knowledge and modern plant facilities second to none. If you have a special problem, write or phone today.

**THE HYDRAULIC PRESS MFG. CO.**
Mount Gilead, Ohio, U.S.A.
A DIVISION OF KOEHRING COMPANY

HPM

1877—1957

# Garan® woven roving wets out and builds up *faster*... cuts production time and cost of reinforced plastics

Garan woven roving can increase your production while reducing labor costs, because it wets out 3 to 5 times faster and conforms to the mold better without extra cutting and fitting. Garan woven roving is less expensive to use than cloth reinforcement because its greater bulk makes build-up 2 to 3 times faster. And finished moldings are color-true because Garan woven roving adds no color of its own to pigmented resins.

Garan woven roving is a coarse, fabric-like reinforcement made from bundles of parallel glass fibers. The exclusive Garan sizing: (1.) protects the fibers during weaving; (2.) improves glass-to-resin bond. Because Garan sizing does these two jobs particularly well, Garan woven roving has special strength . . . makes possible stronger, more durable laminates.

That's why Garan woven roving is the preferred reinforcement among progressive manufacturers of reinforced-plastic products like boats, chemical piping, tooling fixtures, swimming pools and radomes. Find out today how *you* can profit from the timesaving, moneysaving properties you get only by *specifying* Garan woven roving. For sources of supply, write: *L·O·F Glass Fibers Company, Dept. 15-87, 1810 Madison Avenue, Toledo 1, Ohio.*

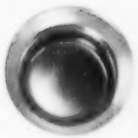
Garan woven roving wets out faster, improves interlaminate bonding in this speedy 40′ R-class racer by Ray Greene & Co., Toledo.

Garan woven roving gives great strength and durability to this 27′ cruiser designed by John Norek; built by Crystaliner Corp., Newport Beach, California.

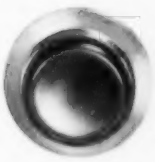
L·O·F GLASS FIBERS COMPANY • TOLEDO 1, OHIO

L·O·F GLASS FIBERS

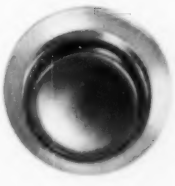
In this Pushbutton World



it's important for manufacturers



and designers who would fully



benefit from the application

of quality phenolics—

*to push the right button...*

PLASTICS ENGINEERING COMPANY

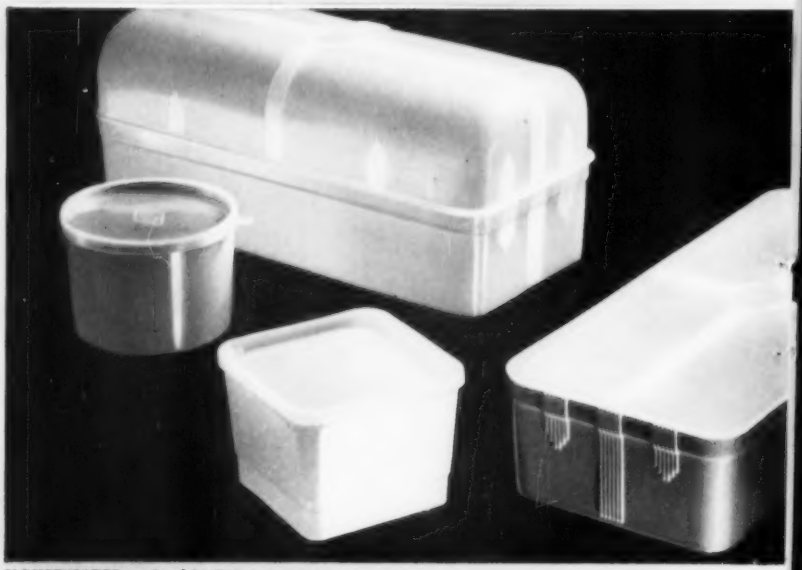
SHEBOYGAN, WISCONSIN

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

*There is a difference in polyethylenes . . .*

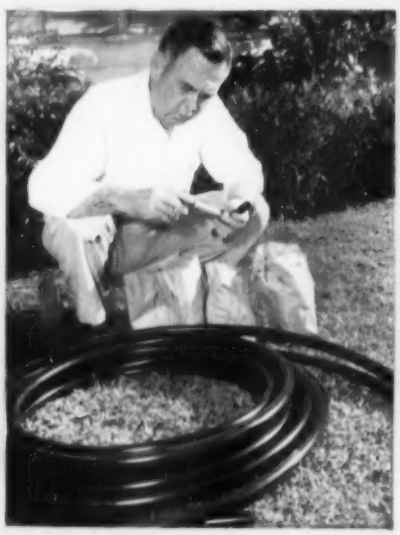
# specify a Du Pont

**SOFT GOODS** get added sales stimulus when packaged in crystal-clear film of a Du Pont ALATHON. ALATHON 34 and 10 polyethylene resins are best suited for this type of application. (Film of ALATHON extruded by Micron Plastics Corp., Brooklyn, N.Y.; converted by Kleartone Transparent Products Co., Inc., Westbury, N.Y., for Catalina, Inc., Los Angeles, Calif.)



**HOUSEWARES** made of ALATHON are strong, yet light in weight and flexible. Easily cleaned, housewares made of ALATHON are tasteless, odorless, non-toxic and attractive due to their high gloss. The properties of ALATHON 37, 17 and 10 are designed for molded products of this type. (Housewares of ALATHON molded by Associated Plastic Division, Commercial Plastics Co., Midland, Michigan.)

**FEEDS AND FOODSTUFFS** stay fresher in packaging material coated or laminated with a Du Pont ALATHON. ALATHON 16 and 34 are well suited for this type of application. (Packaging by Flexible Packaging Div., Standard Packaging Corp., Clifton, N.J.; Dumont Enterprises Inc., Englewood, N.J., for Pet Foods Div., Standard Brands, Inc., New York, N. Y.)

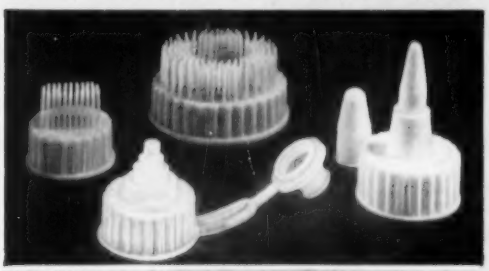


**WIRE AND CABLE** insulated and jacketed with ALATHON is better protected against heat, weather and abrasion. A range of ALATHON polyethylene resins for insulation and jacketing is used by wire and cable manufacturers.

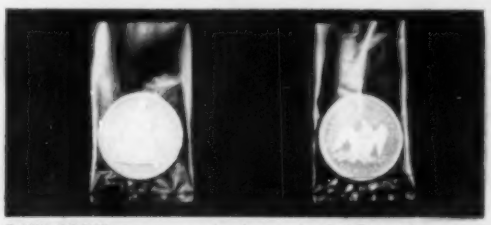
**FLEXIBLE PIPE** made of ALATHON 25 is extra-strong and durable . . . able to withstand maximum pressures and temperatures for longer periods. Pipe made of ALATHON 25 polyethylene resin is light in weight and flexible —provides easy installation.

# polyethylene resin for your needs

**SQUEEZE TUBES** made of ALATHON provide customer convenience . . . new merchandising possibilities. ALATHON 20, 22 and 34 polyethylene resins are especially well suited for packaging applications. (Squeeze tubes of ALATHON by Bradley Container Corp., Maynard, Mass., for Northam Warren Corp., Stamford, Conn.)



**CLOSURES** made of ALATHON can be molded in a wide variety of shapes, assuring not only a tight seal, but also providing unique and functional dispensing action. Some of these action-type closures will dispense controlled drops, atomize sprays, provide long-spout directional flow or dispense through a bristle top for easy brushing action. (Closures of ALATHON by Stull Engraving Co., Garfield, New Jersey.)



**RARE COINS** are among the thousands of different items protected and enhanced with strong, sparkling film of an ALATHON. For this type of application ALATHON 34, 10 and 22 are recommended. (Film of ALATHON extruded by Andmar Plastics Co., Inc., Clifton, N. J. Bags by N. J. Plasti-Bag Co., Inc., Clifton, N. J., for Capitol Coin Co., New York, N.Y.)

## FROM DU PONT RESEARCH—THE DEVELOPMENT OF A FAMILY OF SUPERIOR POLYETHYLENE RESINS

The molecular structure of ALATHON polyethylene resins is controlled during manufacture to provide a range of compositions. Each formulation has certain outstanding properties rendering the resin particularly suitable for specific applications. At the same time, these resins retain the desirable properties inherent in polyethylene. Thus, a selection can be made from this family of polyethylene to suit a particular need.

ALATHON polyethylene resins are inert to most common chemicals . . . have a low rate of water transmission and absorption. Articles molded of ALATHON have good form stability over a wide range of temperatures, retaining their form, unstressed, at temperatures as high as 239°F. Yet ALATHON has extreme low-temperature flexibility . . . its brittleness point is below -100°F. In addition, ALATHON has excellent electrical properties and is resistant to abrasion and heat.

The versatility and superiority of ALATHON are demonstrated in the variety of applications shown at left.

Film of ALATHON combines durability with an unusually high degree of transparency, provides an attractive showcase for many products. ALATHON polyethylene resins are available with additional slip where desirable.

Coatings and laminates of ALATHON are particularly important in food packaging. Its grease resistance and low permeability to water vapor enable it to keep flavor and freshness intact. In addition to these valuable properties, it imparts heat-sealability to other barrier materials such as aluminum foil and Du Pont MYLAR® polyester film.

Molded products of ALATHON have extra strength. Articles such as squeeze bottles and housewares can be molded in appealing designs, attractive colors and versatile forms.

The dielectric characteristics of ALATHON at all frequencies are excellent. Wire and cable insulated and jacketed with ALATHON get maximum protection against heat, moisture and abrasion.

Pipe made of ALATHON has unusual durability . . . is able to stand up under the most rugged farm conditions. Lightweight and flexible, pipe of ALATHON bends easily around corners and obstructions.

It will pay you to evaluate the unique properties of ALATHON in terms of your own operation. For more information, simply clip and mail the coupon below.

DU PONT

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept.
Room 198, Du Pont Building, Wilmington 98, Delaware

Please send me more information on Du Pont ALATHON polyethylene resins. I am interested in evaluating these materials for

_____

Name_____

Company_____ Position_____

Street_____

City_____ State_____

Type of Business_____

In Canada: Du Pont Company of Canada (1956) Limited, P. O. Box 660, Montreal, Quebec

# INCREASE PROFITS TWO WAYS

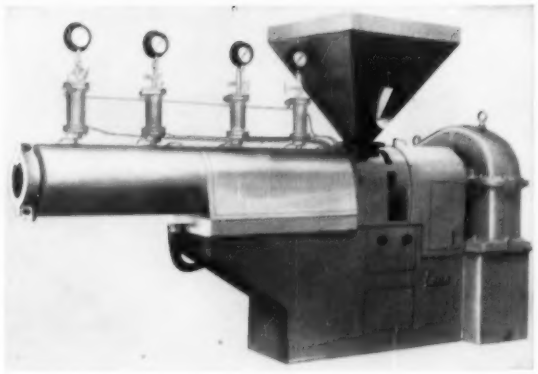
## WITH A COMPLETE EGAN EXTRUSION INSTALLATION

***1*** *Lower manufacturing costs*

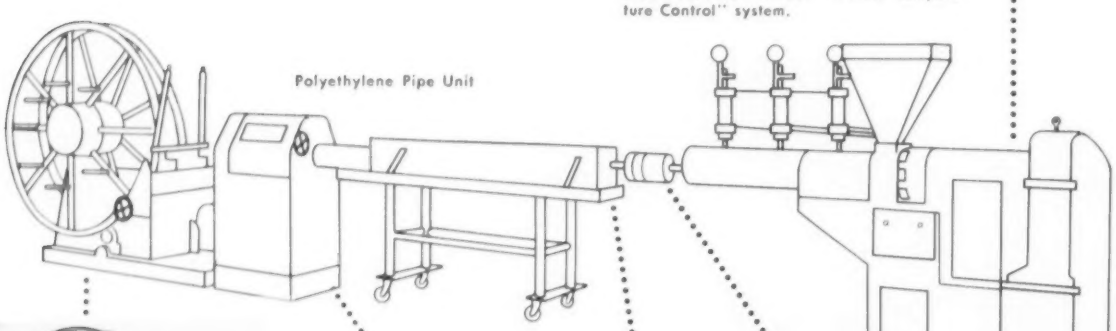
***2*** *Increase production runs*

The success story behind every Egan installation is the extruder proper. Egan Extruders with patented "Willert Temperature Control" systems provide automatic, balanced temperature levels, which result in closer tolerance extrusions with greater speed and ease.

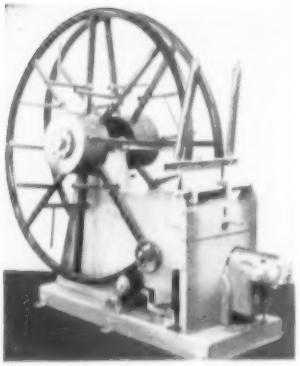
Complete extrusion installations or accessories available for pipe, film, sheet, shapes.



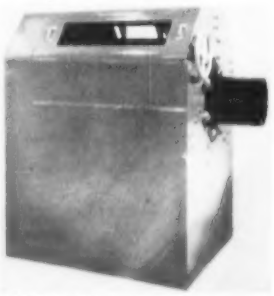
*EGAN EXTRUDERS: pre-set the temperature; "Willert Temperature Control" system takes over, providing completely automatic instrumentation.
*also available without "Willert Temperature Control" system.



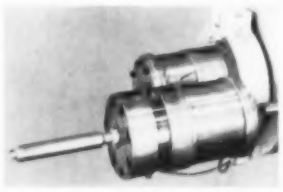
Polyethylene Pipe Unit



COILERS: dual reel type, with or without automatic level wind.



TAKE-OFFS: roller or multiple belt types in diameters of ½"—6" or 3"—14".



DIES: offset or straight-out, with or without extended mandrels.

COOLING TANKS: with vertical and horizontal adjustments.

**FRANK W. *Egan* & COMPANY**

**SOMERVILLE, NEW JERSEY**

Manufacturers of plastics processing equipment

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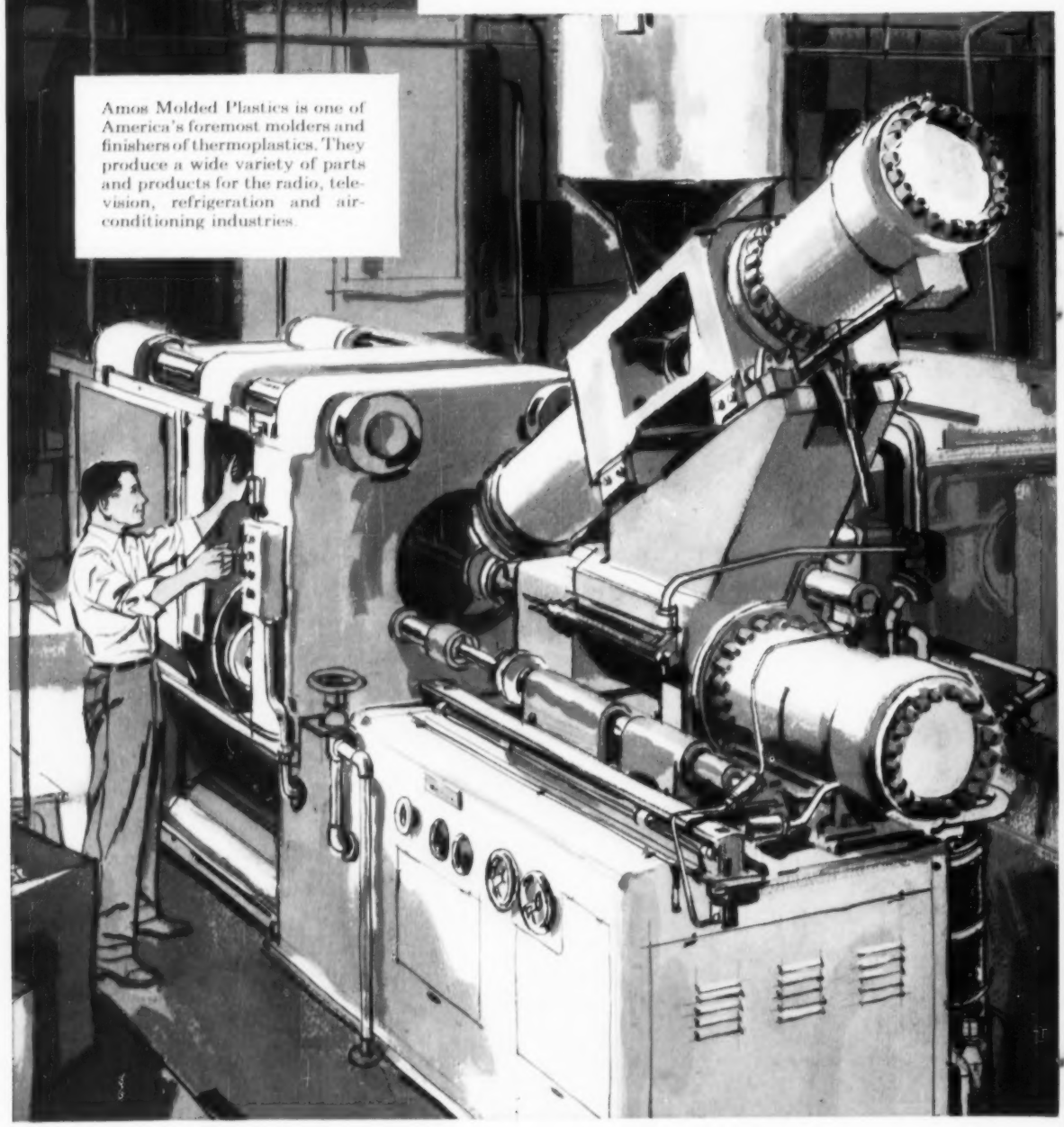
*Correct Lubrication in Action...*

# Hydraulic Pump

Amos Molded Plastics is one of America's foremost molders and finishers of thermoplastics. They produce a wide variety of parts and products for the radio, television, refrigeration and air-conditioning industries.



Mobil **SOCONY MOBIL**

*Leader in lubrication for over 91 years*

*in the* **Plastics Industry**

# Maintenance Cost Cut 44%

**One of many maintenance savings achieved for Amos Molded Plastics with the help of Socony Mobil**

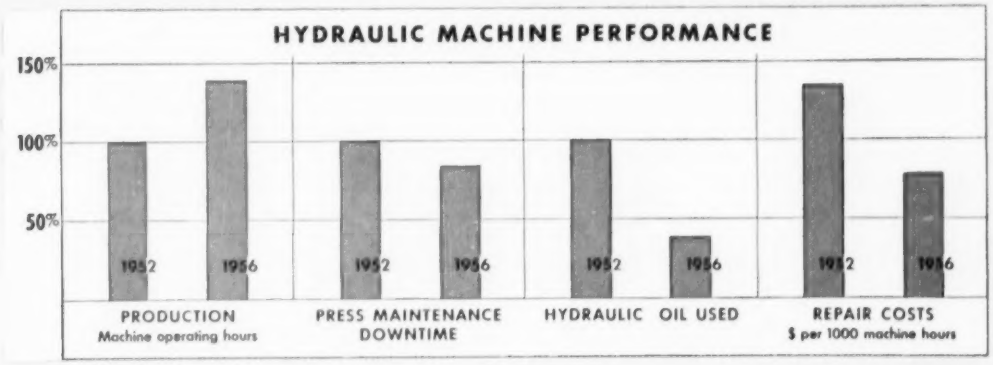
Despite a 37% increase in production hours over a five-year period, Amos Molded Plastics has managed to reduce maintenance and production costs consistently. This leading plastics manufacturer credits Socony Mobil's program of Correct Lubrication with a good share of these savings.

*To illustrate:* Records show that in 1952 molding machine hydraulic pump repair costs ran $135 per 1000 operating hours. Mobil engineers, working closely with the plant engineer, analyzed maintenance procedures . . . suggested improvements. They helped set up lubrication schedules for each machine . . . recommended the correct Mobil product for all equipment. Today, in spite of higher labor and parts costs, repair expenditures have been cut to $76 per 1000 operating hours . . . a reduction of 44%.

*This is Correct Lubrication in Action*—the only program that gives you the benefit of 91 years of lubrication knowledge . . . the services of more experienced lubrication engineers . . . top-quality products. It cut costs for Amos Plastics. Why not for you?

**How Correct Lubrication Cuts Maintenance Costs**

Graph shown here gives an accurate picture of results achieved for Amos Plastics through Mobil Correct Lubrication. Some ways this remarkable record was accomplished are detailed below.




**Machine downtime cut** — Excessive downtime of molding machines was found to be due to oil leakage and oil contamination. Mobil engineers recommended improved oil seals . . . set up periodic laboratory analyses . . . proposed annual cleaning of hydraulic systems. This cut downtime 17% . . . saved $13,800 over 1952 figures.

**Oil consumption cut sharply**—Socony Mobil maintenance clinics, conducted for plant's hydraulic engineers, taught them latest methods of reducing leakage. In addition, because Mobil hydraulic oils are of top quality they can be reprocessed and used indefinitely. Result — oil use was reduced 63% . . . $4,600 saved yearly.

These savings and many more helped Amos Molded Plastics increase profits. For information on how Mobil Correct Lubrication can cut costs, improve production, contact your Mobil representative.

*Correct Lubrication*

**A proved program to reduce maintenance costs**

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

# How VYGEN® helped to create an exciting, fast-selling new concept in casual furniture

Colorful Vinyl cord selected for its

- RESILIENCY
- PLIABILITY
- STRENGTH
- COLOR RANGE

Faced with the challenge of developing a new, modern line of casual furniture, the O. Ames Co. decided to combine smart tubular steel with colorful plastic "cord". Conneaut's Vin-Con* cord, compounded with General's VYGEN® PVC resin, was found to be the ideal solution to Ames' demand for rugged, long-wearing seat and back material.

Available in six decorator colors, Ames Aire* furniture was an immediate success with retailers and consumers. Much credit for this success must be given to the unique use of plastic cord, and to Conneaut's "know-how" in material selection and manufacturing. For more information on how versatile VYGEN resins can help solve *your* problems, write to: *The General Tire & Rubber Co., Chemical Division, Akron, Ohio.*

*Vin-Con cord is extruded by The Conneaut Rubber and Plastics Co., Division of U. S. Stoneware Co., Conneaut, Ohio.

*Ames Aire furniture is manufactured by the O. Ames Co., Parkersburg, W. Va.

**THE CORD THAT LOVES PUNISHMENT**

Vin-Con cord compounded with Vygen PVC resins has the following properties required for this application:

Absolutely colorfast • Resistant to fading • High gloss • Will not support combustion • Resistant to all types of normal chemical compounds found in and around the home (detergents, alcohol, etc.) • Excellent memory . . . when elongated 50 per cent it recovers 97% in no more than 5 seconds. Shows no signs of permanent deformation after being elongated 100% for 50,000 continuous cycles.

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Chemical Division GENERAL

THE GENERAL TIRE & RUBBER CO.

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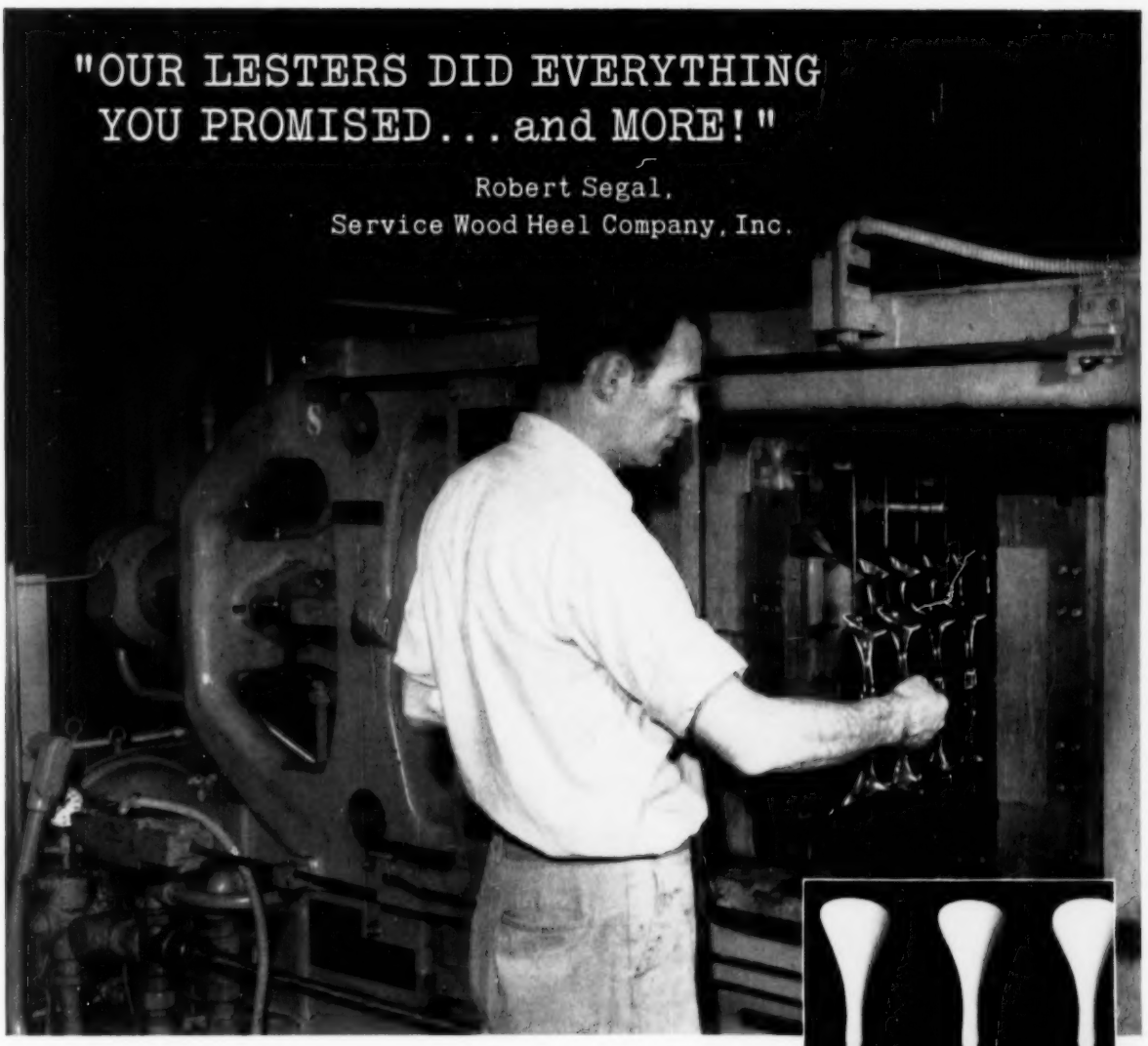
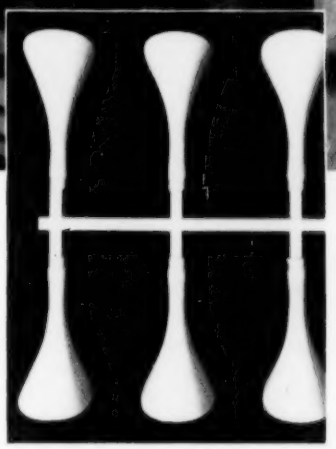
# "OUR LESTERS DID EVERYTHING YOU PROMISED... and MORE!"

Robert Segal,
Service Wood Heel Company, Inc.





"When we first discussed our plastic heel molding project, you told us that your machine would surprise us by its performance. I want to let you know that we are getting 16% more production on your machine than on any other. It's better than anything we've ever seen before. Our Lesters did everything you promised...and more!

Sincerely,

Robert Segal

Robert Segal,
Service Wood Heel Company, Inc.

P.S. Can you improve delivery on the other two machines we've ordered?

*Want complete specifications? Write today for Bulletin 202.*

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*Agents in principal cities throughout the world*

**See why customers prefer** soft goods wrapped in glass-clear films made from Spencer's new exclusive 2400 series polyethylene.

# Are You Using This *New* Glass-Clear Polyethylene?

## New Spencer 2400 film grade resins also are stiffer and easier to handle, yet cost nothing extra:

**Extruders are now switching** to a new, glass-clear film produced from the exclusive "Poly-Eth" 2400 series resins. And they report that by actual comparison, this film is twice as clear as conventional polyethylene film, and it has a higher gloss.

**This means greater package beauty** than has ever before been possible for soft goods wrapped in polyethylene film. It means no color dulling due to semi-opaque film. Every color, every line is as sharp and clear as though you were looking at it through a window.

**The film is stiffer, too!** Test it yourself—twist it, crumple it in your fingers. You'll find that film made from a "Poly-Eth" 2400 series resin is the stiffest standard film you can buy today!

**Also, it's easier to feed** this film into bag machines. And, because of its extra stiffness, it's easier to stack the finished bags. Excellent runs have been processed at 0.4 mil thickness with both blown and flat film.

**You get faster filling** when you use this film, because it opens so much more easily. Test it with your fingers. Discover for yourself how free it is from tack and clamminess. And because it is less permeable, it is extra suitable for laminating.

**Tailored to your needs,** this new "Poly-Eth" 2400 series resin comes in three different compounds: 2405 has no slip, 2425 has medium slip, and 2455 has high slip.

**This is the answer** to a packager's dreams: the durability of regular polyethylene combined with *extra* stiffness, plus *glass-like* clarity. Yet a "Poly-Eth" 2400 series resin costs no more than regular polyethylene! If you're interested in film for soft goods, textiles, candy, or bakery goods, find out more about this newest forward development in packaging.

**For boilable film** use Spencer's new "Poly-Eth Hi-D." Film made of this exclusive resin will withstand heat up to 240° F. And, unlike other boilable plastics, "Hi-D" film can be heat sealed. Ideal for packaging food as well as acids, volatile chemicals or metal parts. Write for information.

Poly-Eth *by* SPENCER

**SPENCER CHEMICAL COMPANY**
**Dwight Bldg., Kansas City 5, Mo.**

send for technical data on

# IMPREGNATED GLASS FABRICS FOR HIGH TEMPERATURE APPLICATIONS 60° F TO 10,000° F

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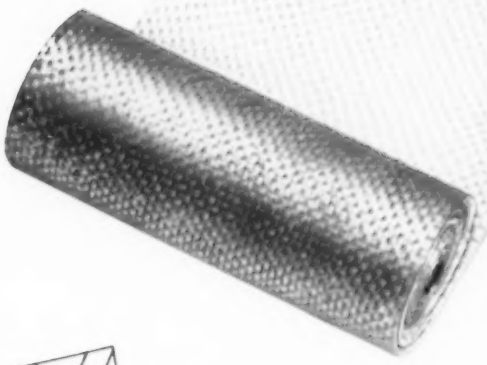

## SEND COUPON FOR DATA ON IMPREGNATED MATERIALS TO SUIT YOUR NEED

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Please send me data on materials for the temperature ranges or resin systems I have checked below:

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- ☐ 800°F to 1500°F
- ☐ 1500°F to 10,000°F
- ☐ Phenolic
- ☐ Epoxy
- ☐ Silicone
- ☐ Polyester
- ☐ Fabric
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FABRIC WITH "LUREX MM"†

*For United Air Lines Interiors...*

# Designer Raymond Loewy selects luxurious fabrics highlighted by metallic yarns made with MYLAR®

**Stronger, more durable metallic yarn ...another example of versatility found in Du Pont "Mylar"* polyester film**

There's new luxury aloft in United Air Lines' ultramodern DC-7's, thanks to internationally known designer Raymond Loewy, Head of Raymond Loewy Associates. To complement the interior décor, Mr. Lowey selected a blue seat-cover fabric highlighted with sparkling gold metallic yarns made with Du Pont "Mylar" polyester film.

"When we were creating this décor for United," reports Mr. Loewy, "our primary function was to resolve a pattern of colors and shapes to provide functional comfort and eye-pleasing tones. Just as important, every material—every finish down to the last detail—had to provide long-lasting durability within a well-defined budget. That's why we selected seat-cover fabrics using gold metallic yarns made with 'Mylar'. These yarns provide a rich touch of luxury in areas of constant abrasion, flex, wear."

**HOW CAN YOU USE MYLAR?**

Metallic yarns are only one example of the many uses for Du Pont "Mylar" in the design field. As a surfacing material, "Mylar" has already proved its value with quality manufacturers in the home-furnishing and industrial markets. Flexible "Mylar" can be metalized, embossed, punched or worked into a thousand different shapes and designs. For more information on how you can use "Mylar"—or products made from "Mylar"—send in the coupon below.

*"**MYLAR**" is Du Pont's registered trademark for its brand of polyester film.

†"**LUREX MM**" is a registered trademark for Dobeckmun's brand of metallic yarn made with metalized "Mylar".

In Canada, "Mylar" is sold by Du Pont Company of Canada (1956) Limited, Films Div., P.O. Box 660, Montreal, Quebec.

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DU PONT MYLAR® POLYESTER FILM

☐ Please send me information on properties, applications and types of "Mylar" available (MB-11).

☐ Please send me information on metallic yarns made with "Mylar".

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Because of the greater strength of Marlex 50 compared to conventional polyethylene, less resin is required to achieve desired rigidity in any item.

# Marlex* 50 Gives You More Items Per Pound of Resin

MARLEX makes it possible for you to manufacture stronger products from less material . . . and because MARLEX sets up at higher temperature, you can achieve faster production. These are important manufacturing economies.

Greater strength, greater ability to withstand heat and cold, superb resistance to penetration by moisture, gases, oils and chemicals . . . all these qualities make possible the manufacture of many new and better products from MARLEX. Write your nearest Phillips Chemical Company office for further details.

*MARLEX is a trademark for Phillips family of olefin polymers

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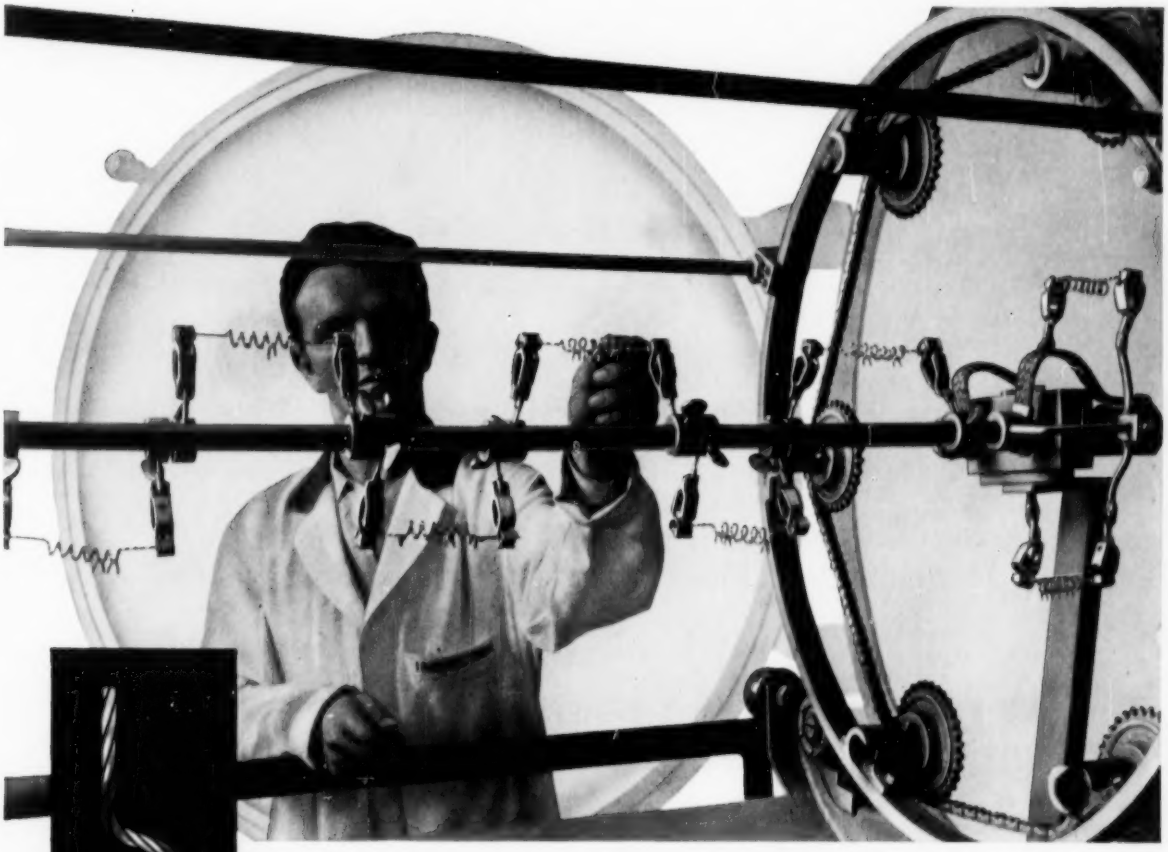

# Looking for more "shots per dollar" in vacuum metallizing coils?

By switching to the best coil design, vacuum metallizers have realized as much as 30% more shots per dollar from Sylvania Tungsten Coils. Why is this possible? Because Sylvania helps vacuum metallizers find the right coil to do their job most economically. Whether you buy ready-made coils or form your own from tungsten strand, Sylvania is ready to help you get maximum efficiency.

If your metallizing process calls for a custom-made coil, Sylvania can recommend the best design consistent with the equipment you're using and the metallizing job to be done. In many cases, metallizers can get top efficiency from an existing Sylvania design, many of which have already become so popular they are considered standard.

Sylvania coils are formed of high-density tungsten strand manufactured to exacting standards of quality control. Sylvania Tungsten Strand is available in 3 to 7 ply with wire diameters of 0.020 to 0.600 inches per strand.

We invite you to write, outlining your specific requirements and problems. You'll find Sylvania is your best source for vacuum metallizing coils designed and built to offer "more shots per dollar."

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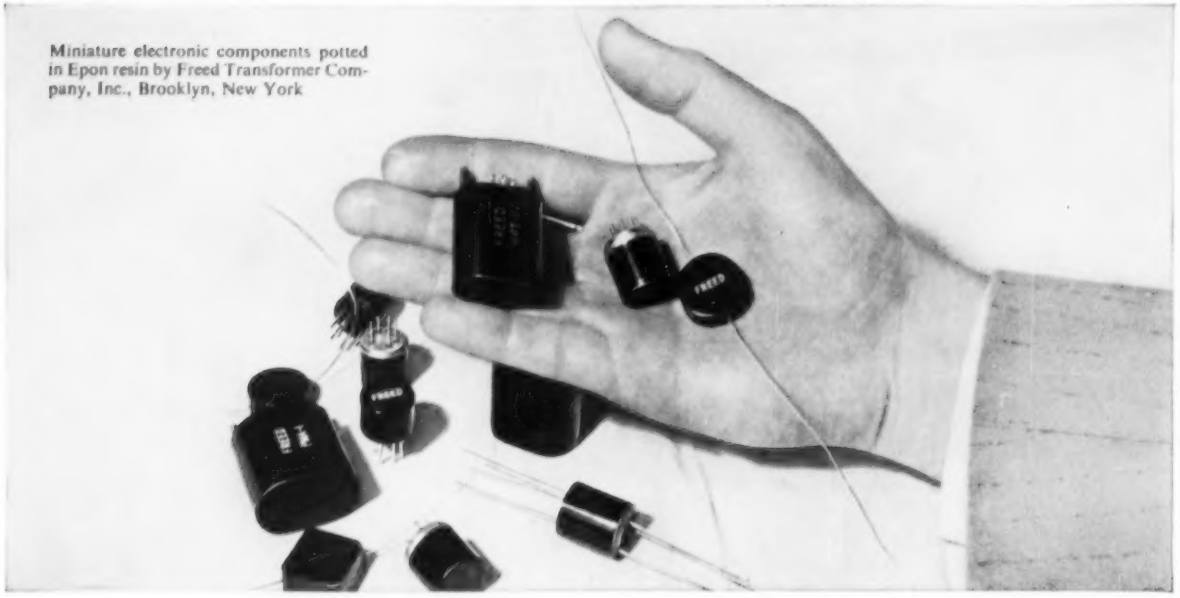


Miniature electronic components potted in Epon resin by Freed Transformer Company, Inc., Brooklyn, New York

# Why **EPON®** **RESINS** for potting?

## 4 Good Reasons!

1. Outstanding adhesion to metal, glass, plastics
2. Excellent dimensional stability
3. High mechanical strength
4. Excellent dielectric properties

EPON RESINS are preferred for potting, laminating, sealing and encapsulating because they offer an almost ideal combination of electrical and physical properties.

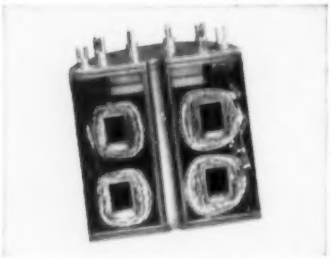
**Potting and encapsulating.** Epon resins have outstanding adhesive properties. They form strong bonds to metal and glass, provide airtight enclosure of delicate components and vacuum tubes. They also have excellent dimensional stability and can withstand solder bath temperatures.

**Sealing.** Enamels and varnishes based on Epon resins provide excellent moisture sealing plus outstanding resistance to solvents and chemicals, even at elevated temperatures.

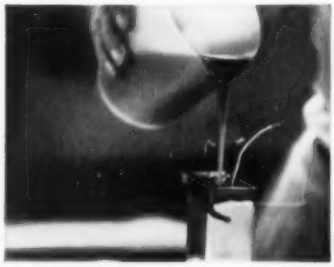
**Laminating.** Epon resins, laid up with inert fibrous fillers, produce base laminates of superior dielectric properties which can be sheared, punched, drilled and bath soldered.

**Adhesives.** Solvent-free Epon resin formulations cure at room temperature, with contact pressure alone; form powerful bonds between glass, metal, wood or plastic.

Write for complete information on the use of Epon resins in protective enamels, tool and die materials, etched circuit laminates, transformer and motor sealing compounds.



Section of magnetic amplifier coils embedded in Epon resin by Westinghouse Electric Corporation, Pittsburgh, Pa.



Potting transformer with Epon resin at PCA Electronics, Inc., Santa Monica, Calif.

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**CHEMICAL SALES DIVISION 380 Madison Avenue, New York 17, New York**

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SHELL

# The Plastiscope*

**August 1957**

News and interpretations of the news

By R. L. Van Boskirk

## Section 1

**On the line with polyethylene.** Hercules Powder Co. and Prof. Dr. Karl Ziegler stole the spotlight on polyethylene happenings last month. Hercules announced the opening of its new 30 million-lb. plant at Parlin, N. J., for production of Ziegler-type low-pressure-processed polyethylene and introduced Prof. Dr. Ziegler himself to the press at a conference in the swank "21" Club in New York City. Hercules emphasized several points, not the least of which is its association with Farbwerke Hoechst A.G., Frankfurt, Germany, whereby the two companies will trade technical and market information on polyolefin plastics. Hoechst was the first company to obtain a license for the Ziegler process and has been in actual production for a year or more.

Hercules has already sold over 1 million lb. of Hoechst-produced polyethylene in the U. S. and expects that the know-how provided by that company will enable Hercules to start full-scale production without the usual "shake-down" period encountered by other licensees who bought only a license and had to start from the ground up without know-how. This means that such problems as odor, color, and catalyst contamination are already solved and Hercules' customers will be assured of a uniform product and adequate supply from the beginning of operations.

**From polyethylene to where?** There are many knowledgeable persons who believe that Hercules is among those forward-looking groups who have set their sights far beyond polyethylene—on the further development of polyolefins and stereospecific plastics. Hercules is optimistic about polyethylene but even more so about the possibilities of the new catalyst system which is the key to production of low-pressure-processed polyethylene and will eventually be used for production of many other plastics.

Hercules spokesmen point out that there are thousands of catalyst combinations that may be described as Ziegler catalysts which, when used to polymerize a material, will result in polymers with varying degrees of density, hardness, stiffness, heat resistance, and toughness. When the market demands it, for example, the density of a polymer can be altered to provide specific properties for a specific purpose. Paul Johnstone, director of development of the Cellulosics Dept., says that he knows of no other catalyst system that is as versatile or flexible. Thus, ethylene polymers may be produced with densities as high as 0.960, which are hard and somewhat brittle, or polymers that are as soft and tough as conventional low-density polyethylene.

It is believed in the trade that Hercules' next step in the use of these new catalysts will be toward full-scale production of polypropylene, which has already reached the stage of applications research. If market devel-

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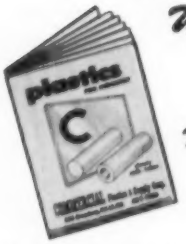
| TEFLON | V | V | V | V | V | V | |
| VINYLITE | V | V | V | | | | |
| ACETATE | V | V | V | V | | | |
| POLYSTYRENE | V | V | V | | | V | V |
| POLYETHYLENE | V | V | V | V | | V | |
| PHENOLIC LAMINATES | V | V | V | | | | |

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# The Plastiscope

(*Continued from page* 39)

opment of the material indicates that polypropylene production is justifiable, commercial-sized facilities will be constructed.

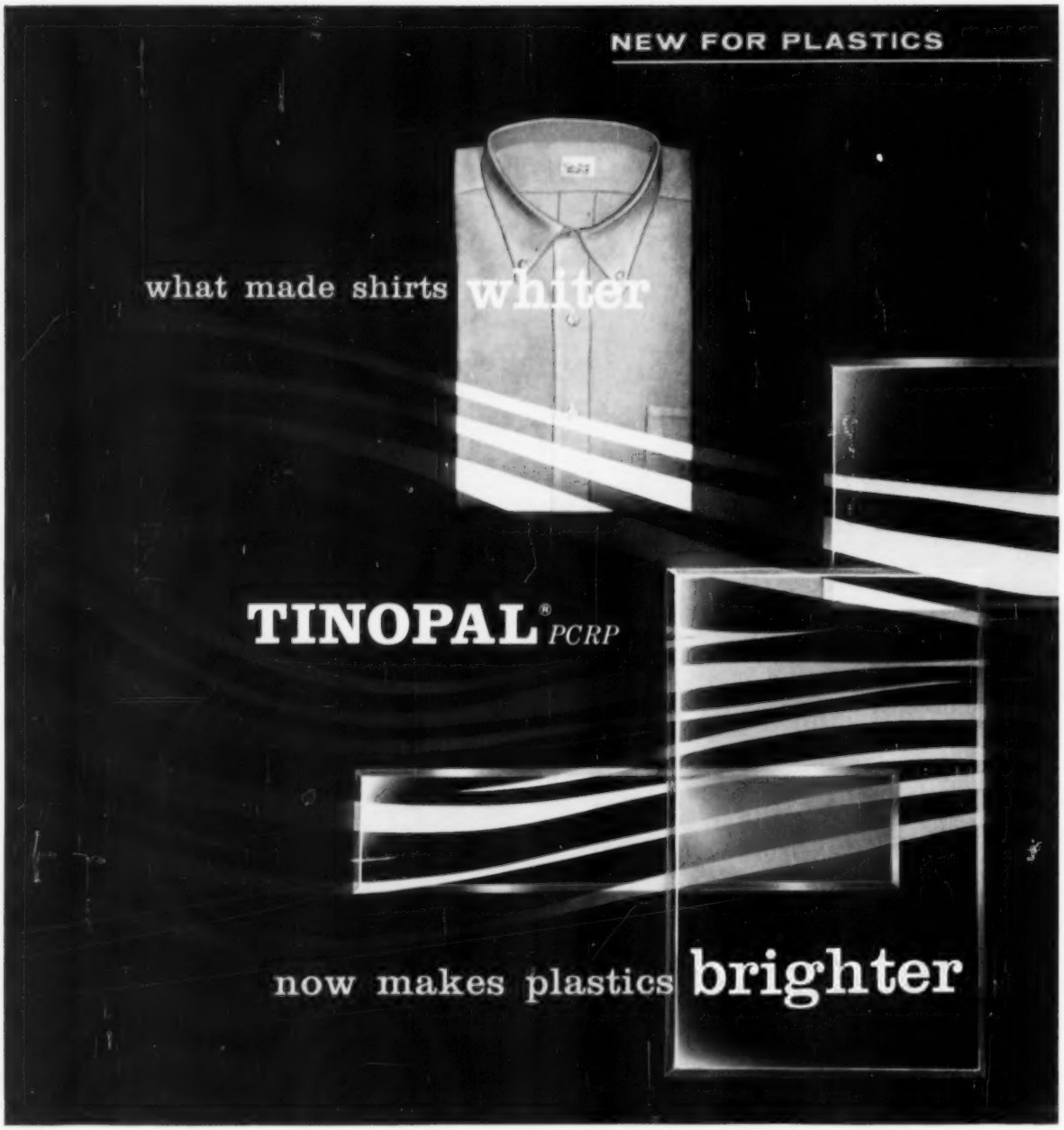
**New dry-blend vinyl resin.** Bakelite has announced a new dry-blend vinyl resin which, used with a new extrusion technique, will process 10 to 15% faster than conventional dry-blend resins, according to company technicians, who advance the belief that this is the most important development in the vinyl extrusion field in 15 years. It is the first dry-blend resin that Bakelite has put on the market and can be blended with plasticizer and other ingredients in a mill or extruder. Dry-blend resins are used for extrusion primarily by processors who do not have Banburys. It is estimated that two or three times more dry-blend resin is used for extrusion purposes today than the older type compounds. In many cases it is claimed to give better results as well as convenience in handling. The new resin, called QYRS, is made by the suspension process. Among its advantages is a high bulk density of 30 to 35 lb./cu. ft., which permits larger output from a blender of given size.

Together with the new resin, Bakelite introduced a new extrusion technique which incorporates a valve between the die and the extruder head to permit controlled pressure. The valve is used in connection with a pressure gage and an immersion thermocouple. It was first developed in the study of quality control for polyethylene extrusion.

Bakelite asserts that the new resin, plus the new technique, yields a product that is comparable with and in some cases superior to that achieved with some of the hot-flux materials now on the market. It is believed suitable for practically any end product now produced by vinyl extrusion.

**Contest for film fabricators.** A plush banquet, at which Vice President Nixon is scheduled to be the speaker, will be the scene of special awards for the most noteworthy vinyl film products. The banquet will be held in New York on December 10 in conjunction with the S.P.I. film meeting at the Commodore Hotel on December 10 and 11. One major award will be made in each of the following categories: shower curtains, rainwear, drapes, closet accessories, kitchen ensembles, inflatables. The awards will be based on styling, workmanship, and functional value. Details have not yet been worked out, but some arrangement will be made so that items of dissimilar dollar value will not compete against each other—no $10 piece against a $2 piece, for example. There will also be special awards on merchandising and packaging. Judges will be impartial experts in styling and merchandising. Fabricators of any of the above items may compete, but items must be in the hands of the S.P.I. headquarters at 250 Park Ave., New York, N.Y., by November 1. Details may be obtained from J. P. Frank of Presto Plastics, 11 E. 26th St., New York, N.Y., who is chairman of the committee handling the contest, or from S.P.I.

**Higher-impact methacrylate molding material.** A modified methacrylate molding powder called Implex has been announced by Rohm & Haas. The Izod impact strength at 73° F. is 2.0 ft.-lb./in. of notch, compared with 0.4 and 0.5 for Plexiglas. Cellulosics range from 0.8 to 6.3 Implex may be compared to medium-




## TINOPAL PCRP USES INVISIBLE ULTRA-VIOLET RADIATION TO MASK YELLOWING OF PLASTICS

Shirts look whiter nowadays, thanks to TINOPAL Brightening Agents.

Now, TINOPAL PCRP benefits plastics, too. Not a dye or a pigment, TINOPAL PCRP is colorless organic fluorescent agent which converts ever present invisible ultra-violet radiation into visible bluish light to increase total light transmission or reflection.

TINOPAL PCRP brightens transparent, white or pastel polyvinylchloride, cellulose acetate, polyethylene, polystyrene, polyester, polyamide and other plastics at concentrations of 0.005-0. 1%. TINOPAL PCRP may be used in sheets, fibers, molded articles, plastisols, lacquers, varnish and overprint coatings; it may be added to plasticizer, base resin or during emulsion or mass polymerization.

TINOPAL PCRP insures high fidelity of color, makes your product more appealing.

*Send today for data sheet and samples.*

TINOPAL is a registered trade mark of Geigy Chemical Corporation

**GEIGY INDUSTRIAL CHEMICALS**
DIVISION OF GEIGY CHEMICAL CORPORATION
SAW MILL RIVER ROAD • ARDSLEY, NEW YORK

# The Plastiscope

(*Continued from page* 41)

impact polystyrene for impact strength. Of course, it does not have the clarity of Plexiglas V because of the modifying agent, but it is translucent in its natural color, something like nylon, and can be produced in a wide range of colors. R & H has not yet made any claims concerning weatherability of the new material, but the amount of methacrylate it contains would indicate that it should weather quite well. Other properties are not quite so high as standard methacrylates except for heat resistance and water absorption, which are about the same. Implex is expected to compete actively in many fields where cellulosics and modified or copolymer styrenes are now employed, such as shoe heels, piano keys, razor housings, pens and pencils, knobs, valve parts, and housings. Its advantages are nailability, fine finish, durability, good strength in thin sections, and freedom from odor.

The price is 56¢ compared with 55¢ for Plexiglas, but its specific gravity is 1.12 compared with 1.18 and 1.19 for other methacrylate compounds. At present, Implex is available only in a molding compound, but extrusion is a future possibility. Full-scale production will start late in 1958.

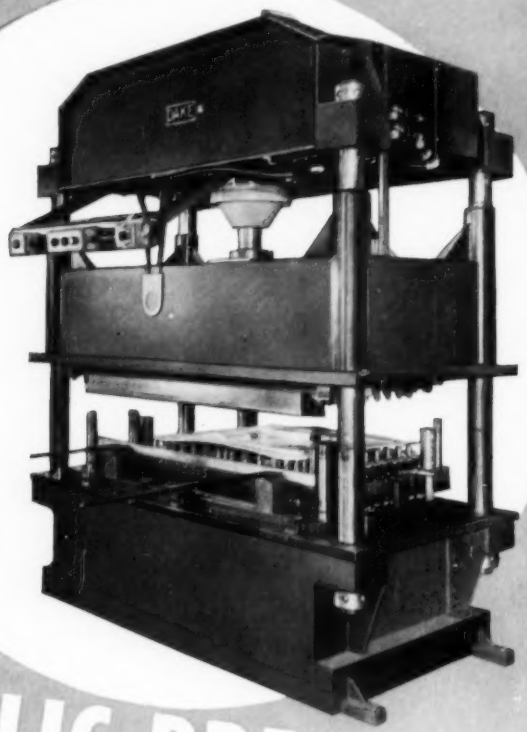
**Improvements in pressure-sensitive adhesive film.** Angier Adhesives Div. of Interchemical Corp. has announced a new release sheet for its Double-Face film adhesive that permits easier release of the backing from the adhesive and gives greater conformance in the finished laminate on which the adhesive is used. Also, the narrow widths of Double-Face are supplied with a release sheet that provides a ⅛-in. extension at the edges so that it is easier to remove from the adhesive. This type of pressure-sensitive adhesive film is a relatively new development in which a solid adhesive replaces liquid glues and can be applied with hand pressure. Angier has had it on the market since September 1956 and suggests its use for bonding plastics materials, electronic parts, leather goods, and in general construction.

**New nylon plant almost ready.** Foster Grant's new nylon-6 plant at Manchester, N. H., will begin operation about Nov. 1. Nylon-6 is the European type of material often called Perlon. Foster Grant has been operating a pilot plant for six months. Its nylon-6 is suggested particularly for blown bottles, blown and extruded film, tubing, and pipe, and for lamination to other plastics. Nylon sunglass frames have already been placed on the market by Foster Grant.

**Primer coat for vinyl-on-metal.** Market analysts believe that metal sheets spread-coated with vinyl plastisols may become one of the finest markets for vinyl chloride within the next five years. However, it is claimed that one of the drawbacks to more rapid development in the past has been lack of a suitable primer for coating the metal before applying the plastisol.

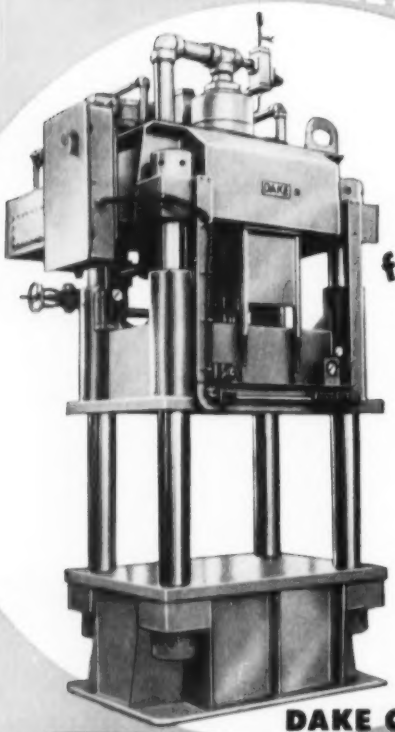
Dennis Chemical Co., St. Louis, Mo., claims to have licked this problem with a new series of primers which give extreme adhesion, permit fast processing, and are not overly critical in application. The Dennis primer is not likely to be affected by over-curing or under-curing under normal industrial operating conditions, which lead to poor initial adhesion at one extreme and poor aging characteristics at the other. The primer can be air-dried. Where

*available in standard and custom engineered models*



for trimming and piercing vacuum-formed plastics

# DAKE HYDRAULIC PRESSES



for molding reinforced plastics

Be a pacemaker in the fast-moving plastics industry with equipment designed to keep production geared to modern trends. Dake Hydraulic Presses speed output and reduce costs. They are job-engineered by men experienced in the plastics industry. These men are ready to help you meet special requirements as well as provide better equipment . . . both for compression molding of reinforced plastics as well as trimming and piercing vacuum-formed plastics. Standard models are electric-hydraulic in operation, with capacities ranging from 25 to 300 tons. They are adjustable for stroke, pressure, temperature and timing. Dual palm-operated controls are standard, providing safety in operation. Dake will gladly work with you in developing whatever special press equipment you need.

**For descriptive literature on these presses, write for Bulletins 340 and 352.**

**DAKE CORPORATION** 648 Seventh St., Grand Haven, Michigan

**DAKE PRESSES**

Arbor Presses | Hand-Operated Hydraulic | Power-Operated Hydraulic | Guided Platen | Gap Type Presses | Movable Frame

# The Plastiscope

(*Continued from page 43*)

the time schedules are critical, it may be force-dried within a minute. It is formulated to eliminate the problem of plasticizer migration and resultant loss of bond between the metal and the vinyl.

Special plastisols in prices ranging from 50 to 70¢ a lb. are provided by Dennis for vinyl-on-metal spread coating. Approximately 6 lb. of plastisol is required for 1 mil of coating on 1000 sq. ft. of metal. The company will give technical assistance to any firm desiring to attempt metal spread-coating and point out that not only steel but any other metal can be coated. Suggested uses for spread-coated metal are business machine housings, auto interiors, building panels, etc. For additional information see p. 210.

**Styrene with combined heat and impact resistance.** Monsanto has introduced a new styrene polymer that combines high resistance to heat distortion with high impact strength. The new material, available in both molding and extrusion formulations, is designated Lustrex Hi-Test 89. It has a heat distortion temperature of 194 to 198° F. Its impact strength is equal to that of Monsanto's Lustrex Hi-Test 88, which is a series of formulations for high-impact materials which may have fast or slow flow, quick or slow set-up, clarity, and other variable properties. But the new 89 adds the particular property of higher heat resistance which molders need for components that are exposed to moderate amounts of electrically produced heat. It is slightly stiffer than 88 but has unusually good flow for a heat-resistant material. The current price for 89 is 34½¢, which is the same as for the 88 series.

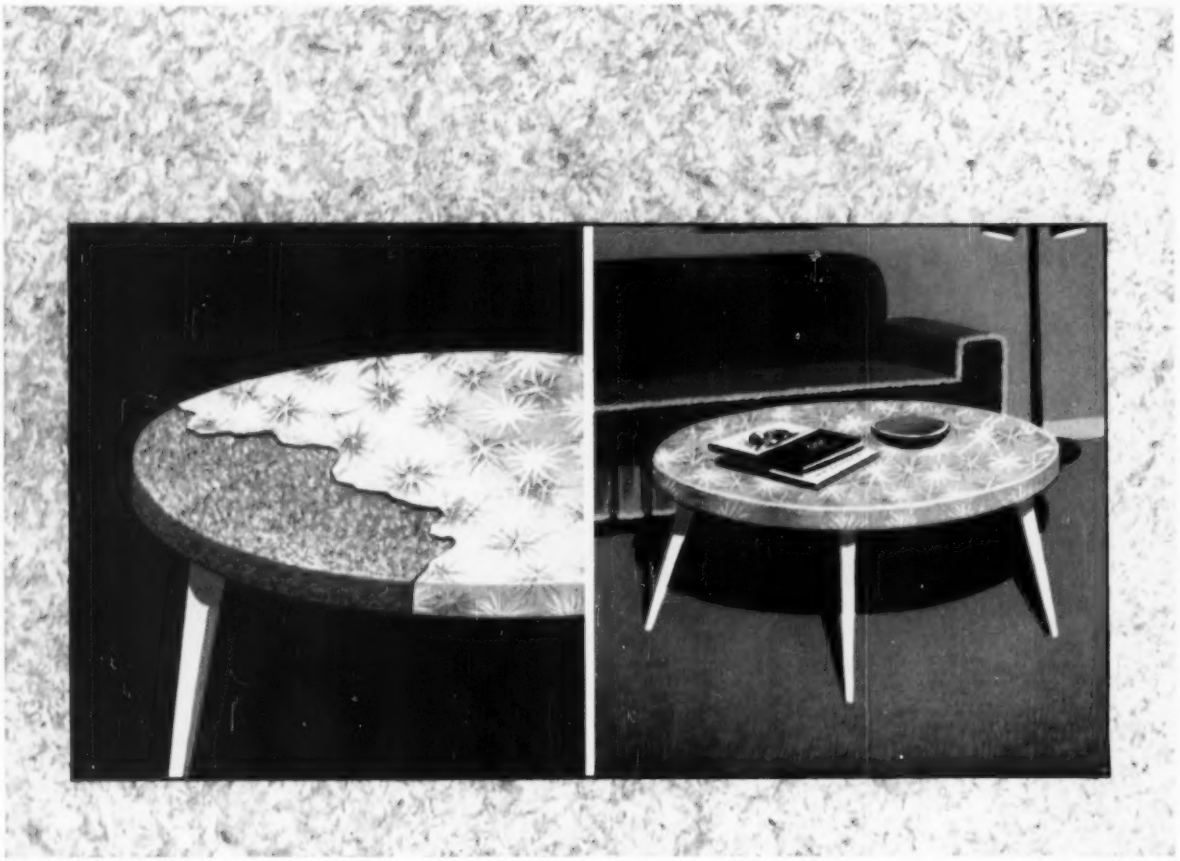
Up to this time, molders have generally used heat-resistant general-purpose polystyrene without much impact strength for the above mentioned components. Impact material formerly available did not go above 85° C. in heat resistance, but the new 89 goes above 90° C. which will permit its use under the Underwriters' new ruling that established a 90° C. test.

**Plasticizer for rigid plastisols.** Monsanto Chemical Co., St. Louis, Mo., reports growing interest in its new Santicizer 214 plasticizer for use in rigid plastisol formulations. It is similar to its phthalate type Santicizer 213 which was introduced last year (see MODERN PLASTICS 33, 38, July 1956) primarily to reduce tack or prevent sticking. However, 214 is claimed to have lower volatility than 213 and better flexibility. It thus gives longer shelf life and improves viscosity of the plastisol. Santicizer 213 can be blended with 214, which has a somewhat higher fusion point, to meet specific requirements. Since a rigid plastisol requires a formulation that is free flowing and hardens a bit after cure, Santicizer 214 (which has low initial viscosity and high Shore Durometer hardness after cure) is particularly efficient when compared with most conventional plasticizers that have greater volatility and don't pour as well.

Santicizer 214 is 32½¢ a lb., in quantity orders, a much lower price than other specialty materials sometimes used to produce rigid plastisols. Best known applications to date for these new type plastisols are wheels for toys, hobby horse bodies, heater ducts for autos, and play balls and other rotationally cast items for which no information is yet available.

**For additional and more detailed news see Section 2, starting on p. 210**

# AN IDEAL BASE FOR BETTER PRODUCTS



## WEYERHAEUSER 4-SQUARE PARTICLE BOARD—
### contributes to outward appearance, inner quality

FOR QUALITY in furniture that's more than "skin deep", investigate the use of Weyerhaeuser 4-Square Particle Board as a core.

This panel material has been especially engineered to meet furniture manufacturing requirements. It is strong, stiff, durable, uniform in density and free of grain and knots. It has smooth, sanded surfaces both sides. No crossbanding necessary. There are no grain or knots to mirror through thin decorative surfaces. Because of the unique rearranging and bonding process of wood particles used, there is no tendency to warp, twist or split.

When laminated or veneered, machinability of 4-Square Particle Board is excellent. It can be sawed, drilled, routed, mortised, grooved and glued like lumber or plywood. Panels cut cleanly permitting tight fitting miters; can be joined by edge gluing, doweling, rabbeting or other standard methods.

Uses are many and varied including coffee, dinette and other table tops; counter, sink and kitchen tops; side panels and fronts of furniture; cabinet and sliding doors. Thicknesses, sizes, densities to meet your needs.

**Weyerhaeuser Sales Company**
DEPARTMENT PJ-87
First National Bank Building • St. Paul 1, Minnesota

**Write for sample**

Check the smooth surface and uniform texture that means better manufacturing results. Write today for free sample and literature.

# *SEEING* IT..IS HALF OF *SELLING* IT

Joseph Davis Plastics

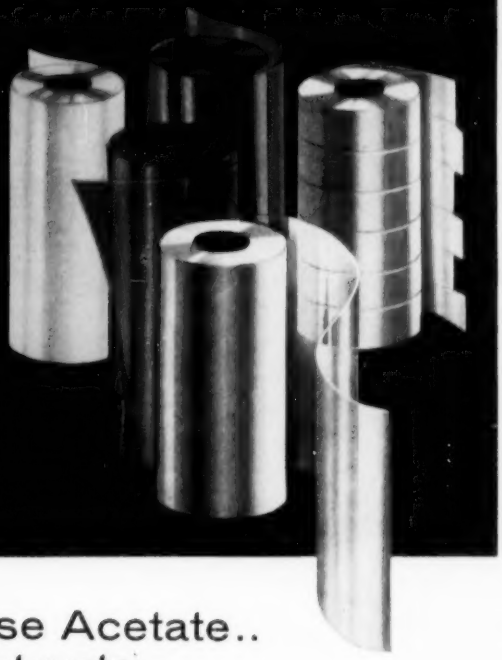
ACETATE SHEETS

and FILM are perfect for

VACUUM FORMING . .

BLISTER and

SKIN PACKAGING



Here are two JODA plastic containers made from one basic die—a striking 2-unit sampler and a self-display 5-unit sales package, both for Winthrop Laboratories suppositories. This package features a tray of JODA Hi-impact Styrene. By

**PLASTIC ARTISANS, INC.**

Port Chester, N. Y.

Cellulose Acetate..
Butyrate..
Hi-impact Styrene

Transparent, translucent, opaque..
light-to-heavy gauges

For further information and samples please contact

**JOSEPH DAVIS PLASTICS COMPANY**

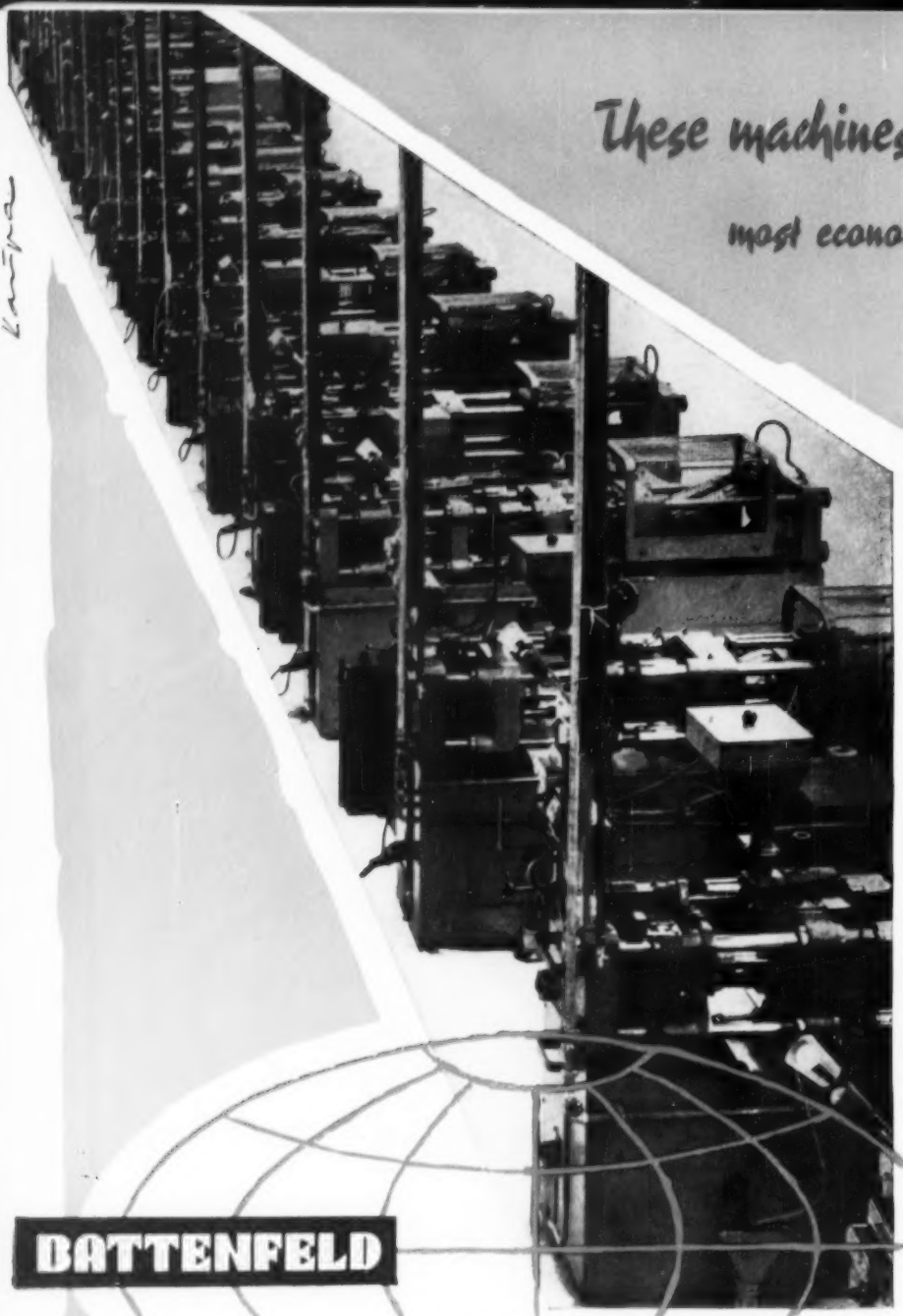
Phone KEarny 2-0980-0981 JODA N. Y. BArclay 7-6421-6422

430 Schuyler Ave., Arlington, N. J.

Sales Representatives Conveniently Located

# These machines give

## most economical production



**BATTENFELD**

The fully automatic operation, simple electro-mechanical design with an amazing record of quality maintained over long production runs at lowest initial and lowest operating costs are the outstanding characteristics of BATTENFELD INJECTION MOLDING MACHINES

More than 2000 Battenfeld INJECTION MOLDING MACHINES are operating in 48 countries all over the world

Sole agents for sales and service **MOLDING SYSTEMS INC.** DANIELSON, CONNECTICUT

Part of a large display sign, internally lit at night, made from 'Perspex' by Pearce Signs Ltd. for the Branch office and depot of Edward Sharp and Sons Ltd. at Audenshaw, Manchester. The parrot (8 ft. 9 ins. high) is made from pieces of coloured 'Perspex' fitted together like a mosaic and on the 6 ft. diameter opal 'Perspex' circle the red letters are 2 ft. and 18 ins. high.

# ...and 'Perspex' is the word for signs!

'PERSPEX' ACRYLIC SHEET makes the best advertising display signs and has many other decorative uses. It is a bright, handsome material, extremely tough, light and easy to handle, and will stand up to weather conditions in any part of the world.

'Perspex' signs are busy selling goods and services all over the world, all day and every day – and often far into the night. Because 'Perspex', in its transparent or translucent form, is ideal for illuminated displays.

'Perspex' is available in clear or opal sheet or in a wide range of transparent, translucent and opaque colours.

**'PERSPEX'**

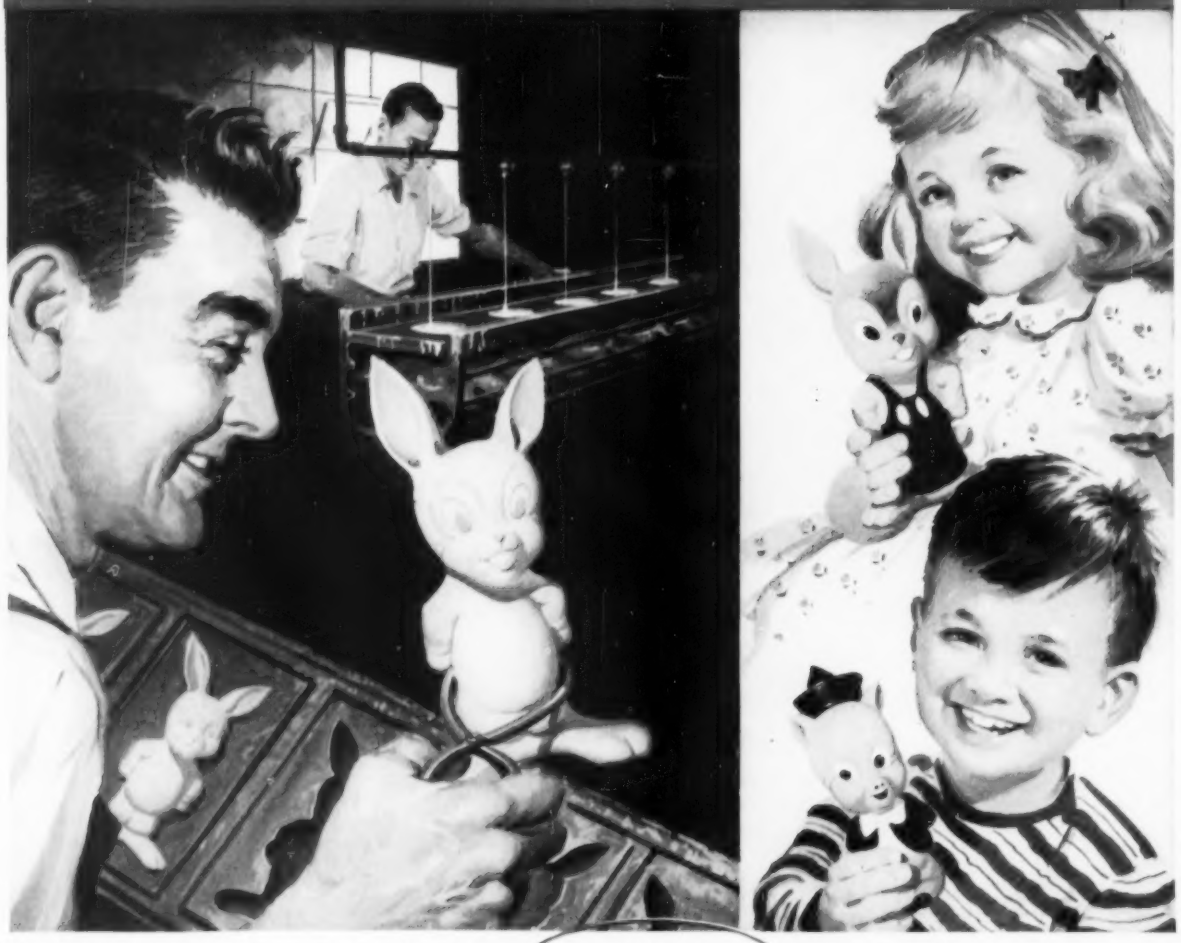
*'PERSPEX' is the registered trade mark for the acrylic sheet manufactured by I.C.I.*

IMPERIAL CHEMICAL INDUSTRIES LIMITED
PLASTICS DIVISION: EXPORT DEPT., BLACK FAN ROAD, WELWYN GARDEN CITY, HERTS.

*U.S.A. enquiries to:* J. B. HENRIQUES INC., 521 FIFTH AVENUE, NEW YORK 17, N.Y.
*Canadian enquiries to:* CANADIAN INDUSTRIES LTD., PLASTICS DEPT., BOX 10, MONTREAL, P.Q.

ICI

# THIS RESIN MAKES PLASTISOL MOLDING TOYS CHILD'S PLAY



## Exon 654 ... specifically for trouble-free plastisols

## ... typical of the Pin-Pointed Properties in Exon Vinyl resins

Slush molders, such as toy manufacturers, find plastisols formulated from Firestone Exon 654 unsurpassed for processing ease.

These plastisols offer excellent viscosity, stability and flow properties. They fuse quickly. And plastisols made from Exon 654 always coat the mold smoothly and evenly.

Exon 654 needs no grinding. It is a stir-in type plastisol resin expressly created to impart excellent heat and light stability, paste viscosity stability, physical toughness and chemical stability to your final products. No wonder toy manufacturers, as other companies who use plastisol molding, specify Exon 654.

Another example of how Exon's Pin-Pointed Properties match your particular needs.

Exon 654 is just one of the many fine resins in industry's most complete line of versatile vinyls. It is another reason why industry looks to Firestone Exon for engineered answers to its needs.

Consider your own production or product problems. Then, for resin properties pin-pointed to the best answer for you, check with Firestone.

Firestone

EXON RESINS

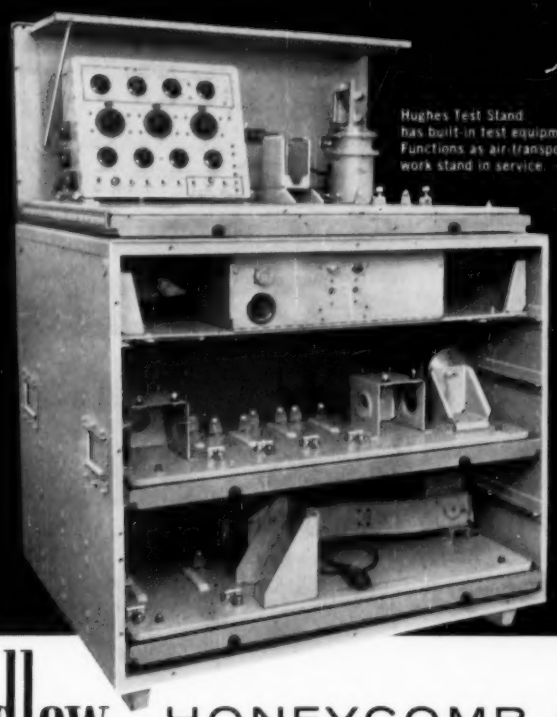
*For complete information and technical service, call or write:*

*CHEMICAL SALES DIVISION:* FIRESTONE PLASTICS COMPANY

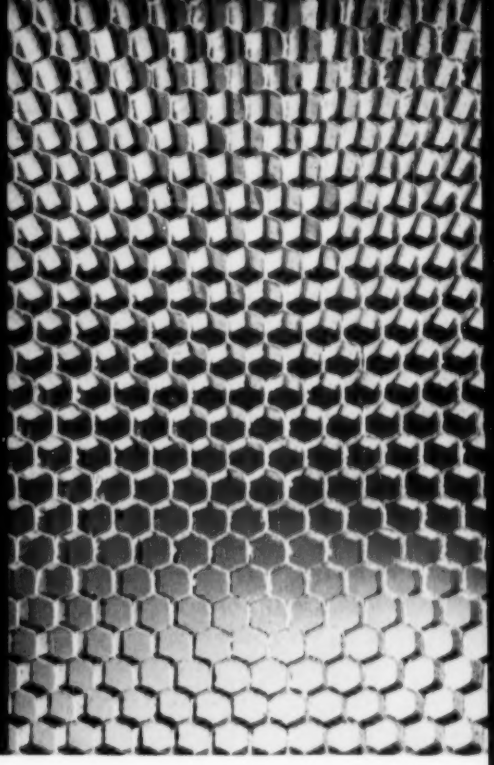
DEPT. 72K, POTTSTOWN, PA. • A DIVISION OF THE FIRESTONE TIRE & RUBBER CO.

IN CANADA: CONTACT CHEMICAL SALES DIVISION, FIRESTONE TIRE AND RUBBER COMPANY OF CANADA LTD., HAMILTON, ONT.

*INDUSTRY'S MOST COMPLETE LINE OF VINYLS ENGINEERED TO YOUR SPECIFIC NEEDS*



Hughes Test Stand has built-in test equipment. Functions as air-transportable work stand in service.



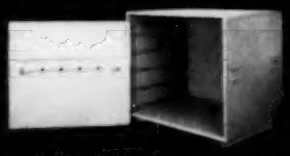
# Swedlow HONEYCOMB PANELS

provide **1. High Strength-Weight Ratio 2. High Rigidity-Weight Ratio 3. High Fatigue Resistance**

for HUGHES Test Stands

Front of Test Stand is removable. It may be attached, as shown, to rear of cabinet. Flip-out shelf is handy accessory feature during testing.

Hughes Aircraft Co. Test Stand is equipped with skids on bottom, and handles on sides for easy handling. Approximately 30" x 40", closed.



Sub-assemblies are mounted on racks, slide in and out.

Work surfaces are flat, rigid and insulated to protect against electrical shorting of circuits.

Armament control systems, radar systems, computer program equipment, and other types of electronic systems are easily tested and quickly serviced by use of these unique, air-transportable honeycomb panel test stands produced by Swedlow Plastics Company to the specifications of Hughes Aircraft Company.

Sides, bottom, and top are of Swedlow aluminum honeycomb material between sheet aluminum faces. Each cabinet contains sub-assemblies and the test equipment necessary for checking out the particular portion of the electronic system it houses. These sub-assemblies are mounted on racks that slide into the cabinet, and are kept ready as spares for instant replacement in the operating system whenever required.

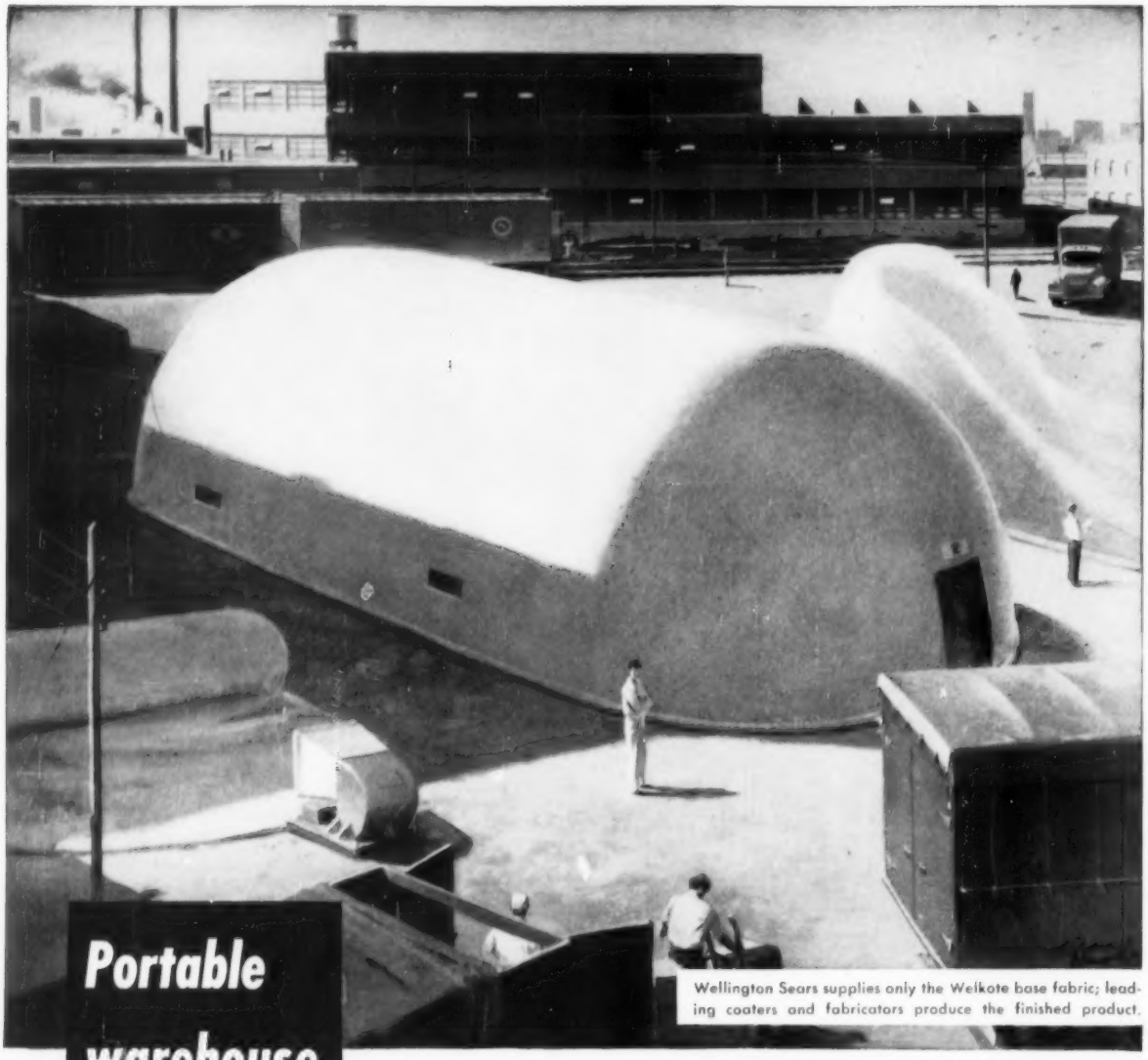
These units, designed by Hughes for use of Air Force Squadron Shop personnel, are also used extensively for training of personnel, because they permit operation of the airborne electronic equipment "on the ground." In addition to their extreme flexibility and wide range of use they feature compactness, light weight and rugged construction, protection against shock, vibration, fungus, heat, and water.

Your inquiries on specific applications for honeycomb core or fabricated honeycomb core parts are invited. ***Please Refer to Dept. 15***

**Swedlow**
**PLASTICS COMPANY**

Los Angeles, California • Youngstown, Ohio

**Swedlow aluminum honeycomb material is available in a variety of core designs, sizes, and thicknesses for applications such as Partition Panelling, Flooring, Stabilizers, Missile Fins, Tow Targets, Tail Assemblies, Ducting, Pressurized Tanks, Radar Vans, Microwave Reflectors, Electronic Gear Housings, Heat Exchangers, etc.**



Wellington Sears supplies only the Welkote base fabric; leading coaters and fabricators produce the finished product.

# Portable warehouse made of fabric "lives" on air!

No visible means of support: *air* does it! Now huge vinyl-coated nylon buildings can be easily packed, transported swiftly to a site, inflated on the spot, and start receiving goods for storage in a matter of hours. And constant, regulated air pressure keeps walls and roofs taut even when doors are open!

As in so many new industrial uses of textiles, the rugged nylon base fabric, *Welkote*, is produced by the mills of West Point Manufacturing Company and supplied by Wellington Sears. Welkote is engineered specifically as a base for vinyl and neoprene coating, and is just one aspect of our textile service to all kinds of industries, for all kinds of uses. We've been doing this for more than a century. Surely you can use this experience to help in solving *your* fabric problems!

For informative booklet, "Fabrics Plus," write Dept. K-9.

## Wellington Sears

**FIRST In Fabrics For Industry**

*For Coated Materials, High and Low Pressure Laminates and Other Reinforced Plastic Products*

WEST POINT TEXTILES

WEST POINT MANUFACTURING CO.

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# New Basic Source for a Widely Useful Solvent and Intermediate

# National NAXOL*

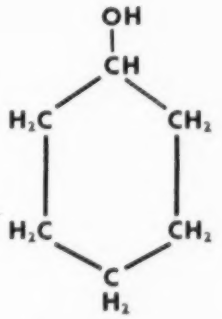
(CYCLOHEXANOL)

Old hands at catalytic processes, National Aniline is in a particularly strategic position to produce consistently high-quality cyclohexanol.

Our modern new plant at Hopewell, Virginia employs an efficient direct process. Our output is substantial, completely integrated within the Allied Chemical group and completely competitive in every respect.

Two types immediately available: NAXOL (100% material) and NAXOL D (Freezing Point Depressed).

We invite inquiries from present and prospective users of either grade and will be pleased to send specifications, working samples, price and delivery quotations on C/L and LCL quantities.

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**ALLIED CHEMICAL & DYE CORPORATION**
**40 RECTOR STREET, NEW YORK 6, N. Y.**

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Columbus, Ga. Greensboro Los Angeles New Orleans Philadelphia
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☐ Please send samples, technical information and quotations on NAXOL.

☐ Please have representative call by appointment.

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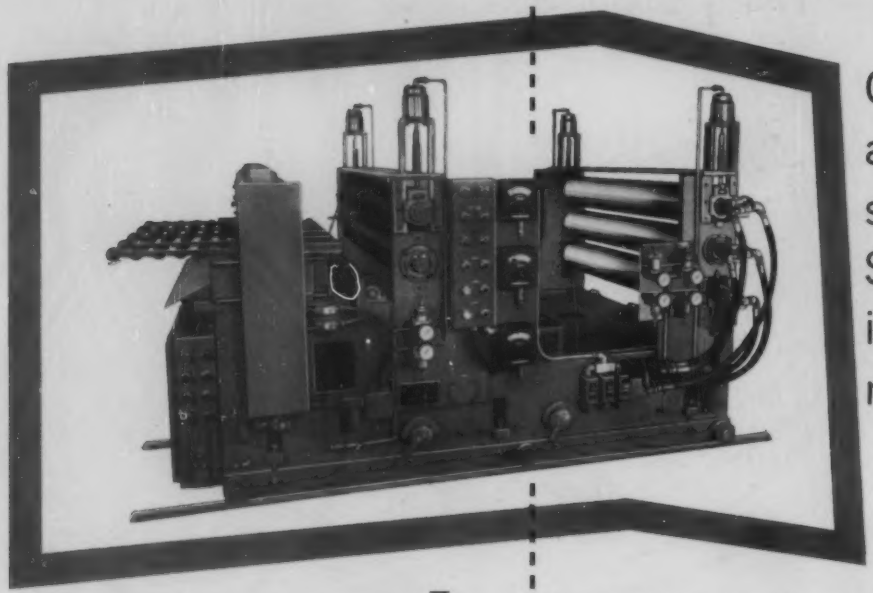
# Robbins

## Haul-Off and Shear Unit



Combined as you see it... Separated if you need it!

▼ Each set of rolls is driven by individual variable speed drives through a heavy duty worm gear arrangement, providing roll speeds to suit extruder.

▼ Finishing rolls — chromium plated, super-finished, jacketed for water, steam, oil heating or cooling.

▼ Top and bottom rolls vertically adjustable — air or manual.

▼ Shear is air or hydraulically operated and travels with sheet to eliminate buckling.

▼ Built-in (3) Zone heat exchanger. Sheet trimmer. Film wind-up.

This latest Robbins combination is being used for production of top quality sheet and laminating. Shown here as a unit, the Chromium Roll and Rubber Roll Shear can he mounted on individual bases for positioning that best fits your needs. Used with other Robbins individual units or special attachments this combination has the flexibility to meet your requirements. Robbins dies and haul-off equipment can be used with all makes of extruders now on the market.

Robbins
never say die . . . say Robbins die

SHEETING DIES A SPECIALTY

**PLASTIC MACHINERY CORP.**

**1430 Mishawaka Street**

**Elkhart, Indiana**

**The Snap-Cap** . . . offers your users unmatched convenience. The cap "POPS" open . . ."SNAPS" shut tightly . . . no matter how often the container is used.

**"Push-Up" Convenience** . . . Push-up Bottom provides the convenience looked for by more and more users of stick-type products.

**Colorful Lithographed Decoration** . . . up to 4 colors . . . colors are bright and permanent . . . line art is crisp . . . lettering is clean and sharp.

# *New . . . Plastic Stick Containers with* SNAP-CAPS

## . . . Push-Up Bottoms . . . and bright lithographed decorations

Three basic advantages make this a sales-package that really works at point-of-sale! Its Snap-Cap . . . Push-up Bottom . . . and printed-label advantages give your product the extra convenience and eye-catching appearance it must have! Ask your Owens-Illinois representative to show you samples of the new Plastic Stick Containers. They're available in a wide variety of colors, in 2-ounce liquid capacity . . . other sizes on request. Call your O-I representative, today! Why not now?

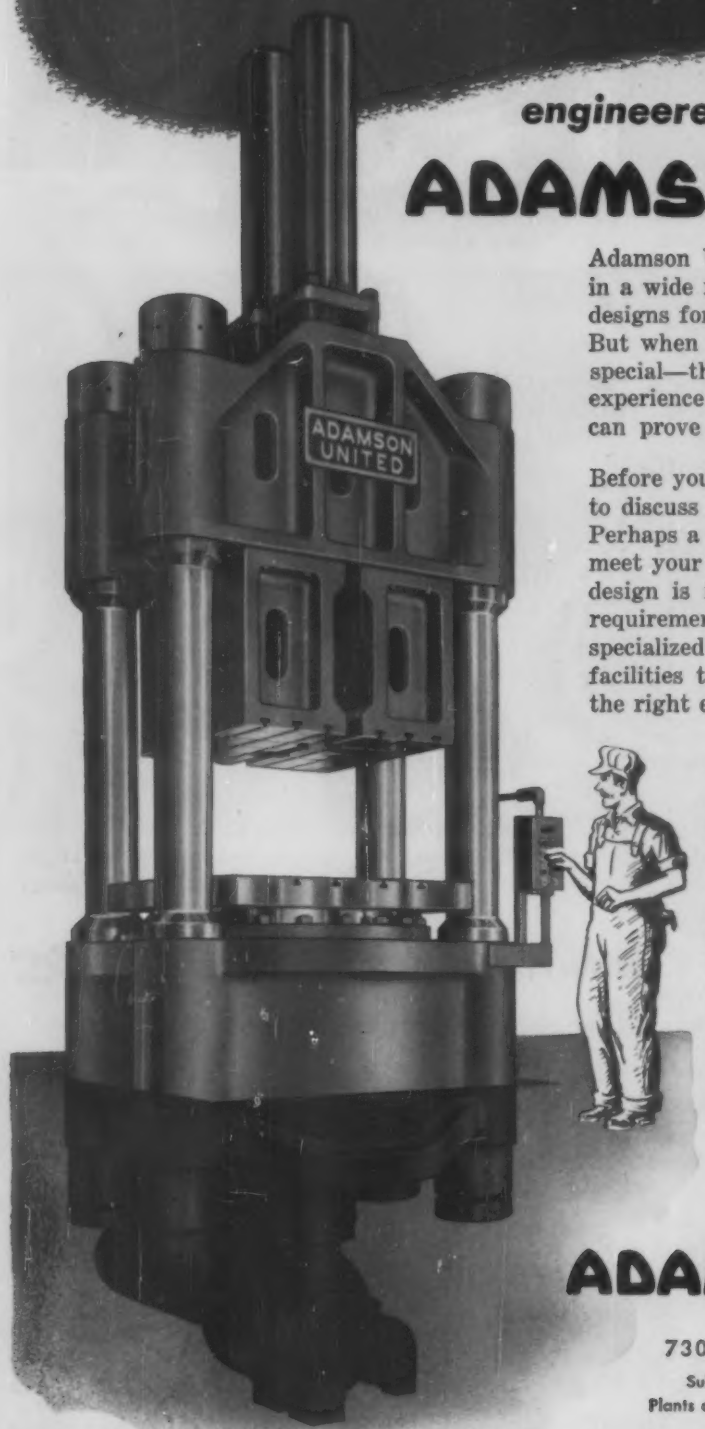
OWENS-ILLINOIS PLASTICS
AN (I) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES • TOLEDO 1, OHIO

*Increase output . . . reduce rejects . . . lower costs*
*with* **HYDRAULIC PRESSES**

*engineered for the job by*

# ADAMSON UNITED




Adamson United Hydraulic Presses are available in a wide range of performance-proved standard designs for the rubber and plastics industries. But when your requirements call for something special—that is when Adamson's extensive experience in press design and engineering can prove most valuable.

Before you buy your next press, we invite you to discuss your problems with Adamson engineers. Perhaps a standard or slightly modified unit will meet your needs. Or possibly a completely new design is indicated. Whatever your specific requirements may be, you can rely on Adamson's specialized engineering and production facilities to recommend and supply the right equipment for the job.

**This 2000-ton self-contained transfer molding press is an excellent example of our custom engineering service. Built by Adamson for Orangeburg Manufacturing Company, Inc., this unit is specially designed to produce large molded pipe fittings. Unusually compact, it occupies minimum floor area. Platen size is 54" x 52". A unique system of valving and pumping provides exceptional versatility, permits precision control over a broad range of speeds and pressures.**

## ADAMSON UNITED
COMPANY
730 CARROLL STREET, AKRON 4, OHIO

Subsidiary of United Engineering and Foundry Company
Plants at Pittsburgh, Vandergrift, Wilmington, Youngstown, Canton

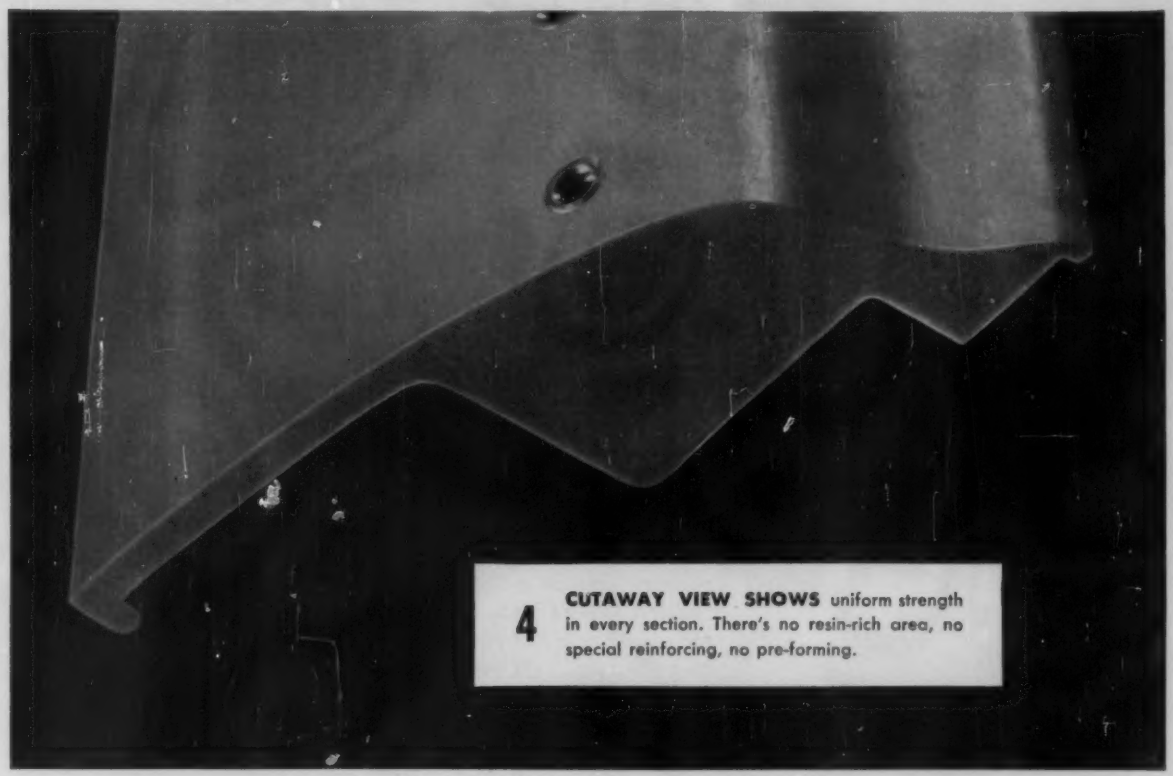
7064

DESIGNERS AND BUILDERS OF BASIC MACHINERY FOR THE RUBBER, PLASTICS AND PLYWOOD INDUSTRIES

**1** This premix consists of reinforcing material, such as fiber glass or sisal, thoroughly mixed with polyester resin containing Dow Styrene.

**2** The premix molding compound flows evenly to each and every section of the closed die as it is compressed under heat and pressure.

**3** After a very short cycle, the finished premix molding is removed from the die. It is now ready for immediate assembly or shipment.



**4** **CUTAWAY VIEW SHOWS** uniform strength in every section. There's no resin-rich area, no special reinforcing, no pre-forming.

# For lower bids: premix moldings

*For uniform strength: polyester resin with Dow Styrene*

Many complicated parts—especially parts with varying wall thicknesses—are now made better, at lower cost, by premix molding. There are no resin-rich areas. Strength is uniformly distributed. Pre-forming is eliminated. And holes and nozzles can be molded in a part, eliminating punching and drilling operations.

Leaders of the automotive and appliance industries have proved the benefits of premix moldings for specific parts. Many innovations are now on the drawing boards.

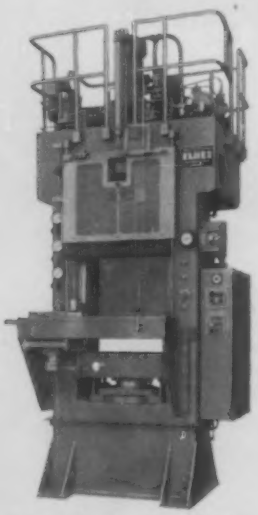
The product shown is an example of the many now being made by premix molding using Dow Styrene. For technical assistance on Dow Styrene, write THE DOW CHEMICAL COMPANY, Midland, Michigan – Plastics Sales Department PL1886E-2.

*Photographs through the courtesy of Fabricon Products, River Rouge, Michigan*

YOU CAN DEPEND ON DOW

# No pressing problem TOO TOUGH for an Elmes

## "Job-Fitted" HYDRAULIC PRESS



*Elmes 200 x 50 ton Transfer Molding Press. This unit was specially designed to meet customer's requirements. Equipped with movable guard gates at front and back for protection of the operator. Extended table with roller knockout at left end permits use of two bottom molds—a great timesaver when working with small or delicate inserts.*

*"Missionary work" needn't get you in a stew.* When development planning presents really tough problems in pressure application—*that's* the time to call Elmes "to the rescue," for consultation and recommendations. More than 60 years of specialized hydraulic press experience makes Elmes preeminently equipped to provide *the right press for the job.*

It may be that a standard-design Elmes® Press—for compression or transfer molding operations, hot-plate laminating, or reinforced plastics molding—will meet all your requirements. Or a simple adaptation may be indicated. Or unusual production requirements may call for development of a special "custom-built" press—a large and important part of Elmes service to industry.

In any event, whatever your particular needs, Elmes experience and ingenuity are your best bet for turning pressing problems into profit-making performance. Distributors in principal industrial centers.

**Elmes** American Steel Foundries
ENGINEERING DIVISION

1159 Tennessee Avenue, Cincinnati 29, Ohio

METAL-WORKING PRESSES • PLASTICS MOLDING PRESSES • PUMPS • ACCUMULATORS

Specify

# IC* POLYESTERS

for Structural Panels that

# Laugh at the Weather!

Manufacturers of structural panels demand a Polyester Resin that gives maximum weathering properties, color fastness and erosion resistance. Where light transmission is important, a resin is needed that wets the glass fibers easily to provide maximum translucency. Combined with IC sun-resistant colors, IC Polyester Resins offer you these properties in the fullest measure. From a single source you can obtain a complete line of dependably uniform resins and companion components that work in harmony to minimize your production problems.

IC Polyesters are available in a wide variety of viscosity and cure characteristics to meet specific plant and job conditions. Add to this Interchemical's technical service, backed by vast experience in solving difficult color and resin problems, and you have a team that's hard to beat.

Write on your company letterhead for new bulletin on IC Polyester Resins for weather-resistant applications, or call your nearest IC Polyester Resin specialist for further details on Interchemical's complete package for durable structural panels.

**Interchemical**
CORPORATION
**Finishes Division**

Commercial Resins Department
1754 Dana Avenue, Cincinnati 7, Ohio  224 McWhorter St., Newark 5, N. J.

Factories: Chicago, Ill. • Cincinnati, Ohio • Elizabeth, N. J.
Los Angeles, Cal. • Newark, N. J. • Mexico City, Mex.
In Canada, these Polyester Resins are made and sold by Chemical Oil & Resin Company, Toronto, Ontario.
*IC is a trademark of Interchemical Corp.

**These are the IC Companion Components for structural panels**

**IC-1026-2 MMA Polyester and IC-1027-2 MMA HV Polyester**
Exceptional weathering properties. Excellent clarity with fiberglass. Contains methacrylate monomer. Fast gel and cure. High viscosity version permits greater additions of styrene monomer.

**IC-312-2 Polyester and IC-420-2 HV Polyester**
Excellent weathering. Fast wetting with fiberglass. Standard cure. Long pot life. All styrene monomer. High viscosity version permits greater additions of styrene monomer.

**IC-1102-2 Polyester**
Excellent weathering. Fast gel and fast cure. Short pot life. All styrene monomer.

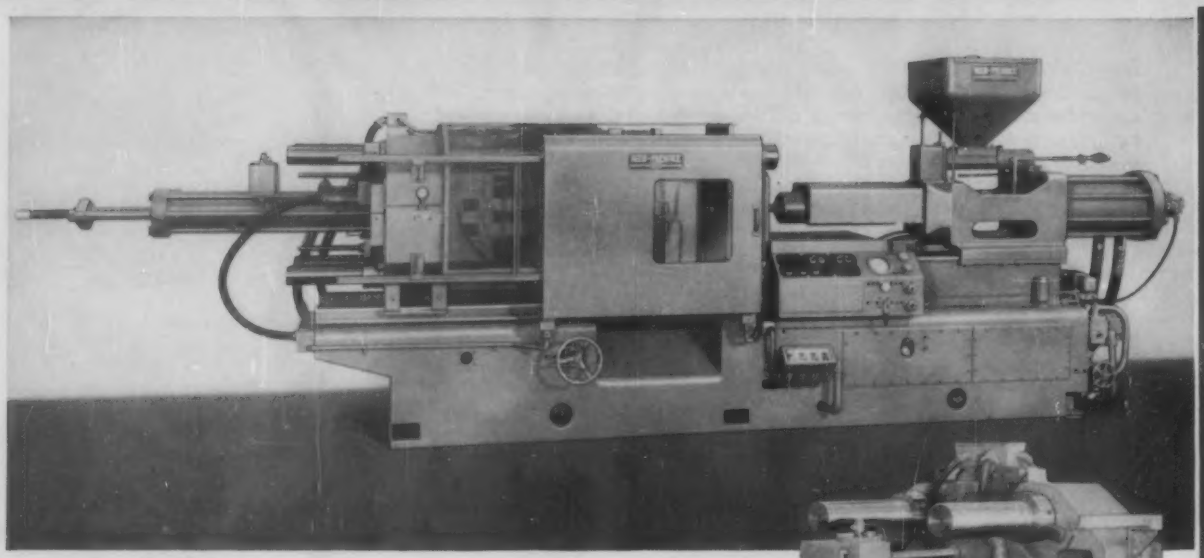
**IC Color Concentrates**
Complete line of sun-resistant pigment dispersions.

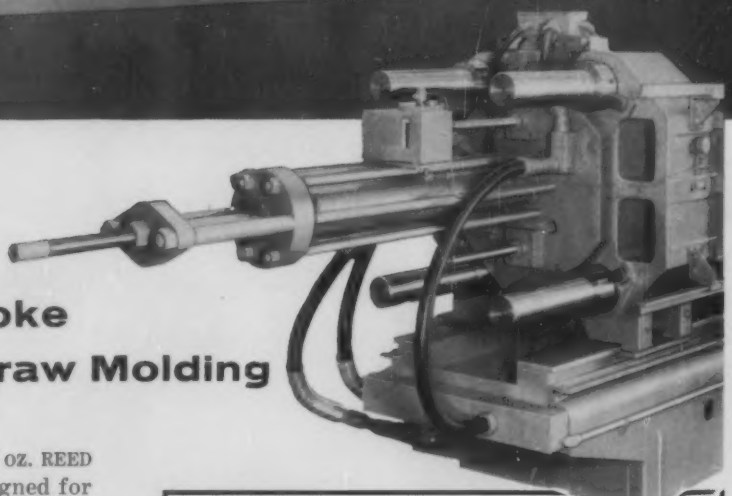
**IC-118 Grinding Vehicle**
Special monomer-free polyester for those who wish to make their own color concentrates.

**IC-14166 Clear Lacquer**
For recoating structural panels in service.

**IC Activators and Promotors**
For adjusting cure cycles.

# Engineered for Modern Molding





## NOW!

### Two New Long Stroke REEDS for Deep-Draw Molding

New 175TL–4/6 oz. and 300TL–12/16 oz. REED injection machines are specifically designed for deep-draw and container molding.

Both models have a completely redesigned link end to give you a longer, more flexible adjustable mold clamping stroke. You get more than a 50% increase in mold depth and greater locking tonnage.

An optional low pressure die closing arrangement prevents damage to the mold in the event a molded piece fails to eject while the machine is running automatically.

Through multiple injection strokes, a built-in stuffing arrangement permits increased injection capacity in each model.

| | 175T 4/6 oz. Standard | 175TL 4/6 oz. Long Stroke | 300TA 12/16 oz. Standard | 300TL 12/16 oz. Long Stroke |
|---|---|---|---|---|
| Adjustable Stroke | 5" to 8" | 6" to 12" | 7½" to 12½" | 8½" to 20¼" |
| Maximum Depth of Molded Part | 4" | 6" | 6" | 10" |
| Dry Cycle Time, Seconds | 5.7 | 7.2 | 10 | 12 |

Centrally located machine controls place the entire operation at the operator's fingertips. Die space adjustments are by hydraulic rather than mechanical means. This makes mold setups and space adjustments faster and easier.

# ...NEW, LONG STROKE REEDS

M.C.I. Plastics typifies the trend toward modern molding methods. Mr. Hartung's ideas on automation have made his plant one of the country's most modern in less than a year. He is presently operating three 175T—4/6 oz. and four 300TA—12/16 oz. REEDS, and has started construction for increased floor space and molding capacity to be completed this year.

## "FOR AUTOMATIC MOLDING, WE USE REEDS EXCLUSIVELY"

*SAYS RICHARD HARTUNG,*
*President of M.C.I. Plastics in Lakewood, N. J.*

"We now produce over 20 million flower pots a year, and expect to increase capacity greatly this year. As far as I'm concerned, automatic molding is the only way to maintain a high volume at minimum cost and space, and with machine-controlled high quality. But the injection machines have to be rugged to stand up to such a grind. That's why I'm a solid REED user. Right now we're running all 7 REEDS automatically, at high speeds. My entire production is handled by 4 men whose main jobs are to keep the hoppers filled and remove cartons of finished products. My maintenance costs are extremely low, and on the rare occasions when I do need service, I can get a REED representative at a moment's notice."

## Modern Molding DEMANDS Modern Equipment

Yesterday's molding machines just weren't built to handle today's production. They haven't the durability or the speed to stand up to the continuous automatic operation you need to maintain a competitive price. But new REEDS are designed with an eye to future molding. Not only will they boost output and cut production costs, but they will continue to keep your profits at a high level.

It costs you nothing to find out how much you can save by investing in new REED equipment.

**A Free Mold Test** in our modern laboratory will determine the full efficiency of your present molds under actual production conditions.

**A Free Production Survey** by a trained Reed-Prentice sales engineer will show you in full detail how much you can improve your present production with new REED equipment.

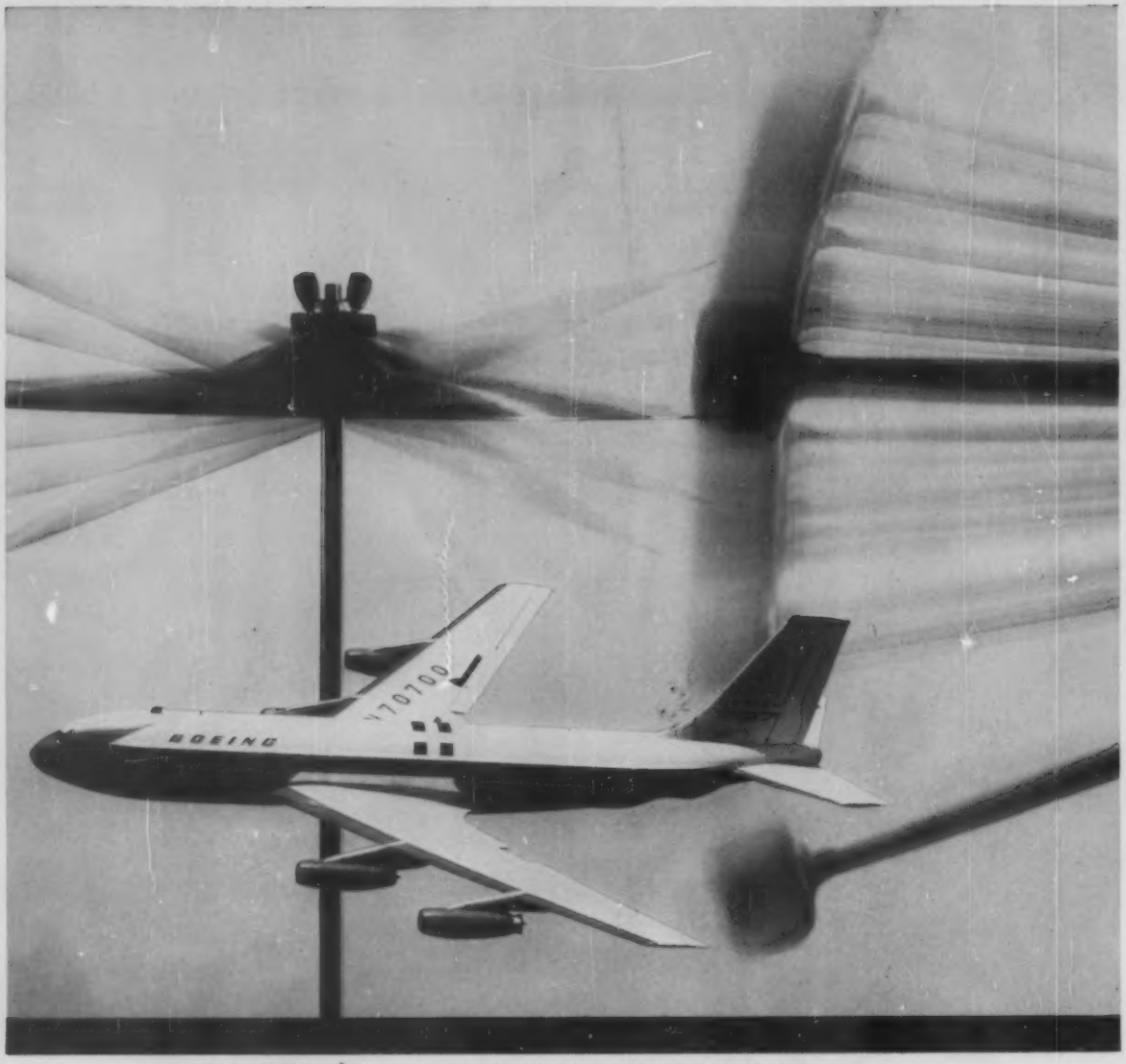
For information about any of these services call the nearest Reed-Prentice sales enginer. He can show you a complete line of injection equipment from 4 oz. to 32 oz. capacities. If you prefer you may write directly to our main office in Worcester.

REED-PRENTICE

..... Affiliate of PACKAGE MACHINERY COMPANY

677 CAMBRIDGE STREET, WORCESTER 4, MASS.

BRANCH OFFICES: NEW YORK • CLEVELAND • CHICAGO • BUFFALO • DAYTON • DEARBORN • KANSAS CITY • LOS ANGELES




# *THERE'S A SOUND REASON FOR HEXCEL HONEYCOMB IN THE BOEING 707*

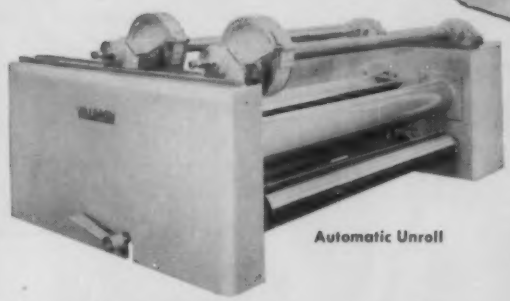
**THE PROBLEM:** The wing's trailing edges, including control surfaces and tabs, are subject to high sound levels created by the exhausts of powerful jet engines. Ordinary structural materials could not resist damage from these acoustics. **THE SOLUTION:** Hexcel Aluminum Honeycomb with its high, inherent rigidity-to-weight ratio is completely resistant to acoustical bombardment. Boeing designers and engineers, working with research and engineering data supplied by Hexcel's laboratories, were able to build these structures–structures which resist acoustical stress, yet are light weight. The 707's tail surfaces have similar Hexcel Honeycomb parts. Hexcel's research facilities and sales-engineering staff are at the aircraft industry's immediate service.

HEXCEL® PRODUCTS INC.
*America's leading producer of honeycomb core materials*
*951-61st Street, Oakland 8, California*

*PLANTS: OAKLAND, BERKELEY, CALIF.; HAVRE DE GRACE, MARYLAND • SALES OFFICES: INGLEWOOD, CALIF.; FORT WORTH, TEXAS; NEW YORK CITY, N.Y.*

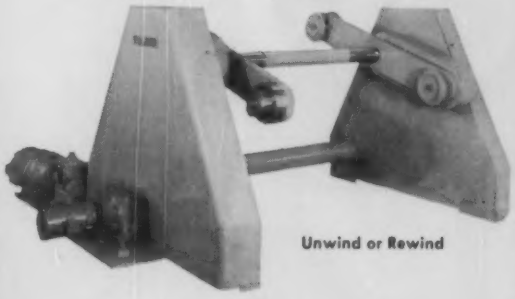
# WALDRON

## *Don't minimize auxiliary equipment ...it deserves careful engineering, too!*



Automatic Unroll

Single Drum
Surface Winder



Unwind or Rewind

**THE ROSS GROUP OF COMPLEMENTING SERVICES**

J. O. ROSS ENGINEERING CORPORATION . . . New York
ROSS ENGINEERING OF CANADA LIMITED . . . Montreal
ROSS MIDWEST FULTON CORPORATION . . . . . Dayton
ANDREWS AND GOODRICH DIVISION . . . . . Boston
CARRIER-ROSS ENGINEERING COMPANY, LTD. . . England
JOHN WALDRON CORPORATION . . . . New Brunswick

Because the coater, embosser, gummer, waxer or other processing machine has a direct bearing on the quality of end-product, full attention is given to the design of the unit . . . and rightly so.

Don't overlook the complementing importance of auxiliary equipment, such as:

**Unwinds** — **Conveyors**
**Rewinds** — **Cooling Rolls**
**Slitters** — **Suction Units**
**Automatic Web Guides**

Improperly designed auxiliaries can impair following operations or undo the good work done previously. Auxiliary equipment is fully as important as the main production unit. Long ago recognizing this, Waldron Engineers sought to design the best possible auxiliary units for handling webs to, through and from the processing machine.

In your planning for that new web processing unit, keep the auxiliaries well in mind. Let us furnish these, too. Then your line will be Waldron throughout . . . a good form of insurance.

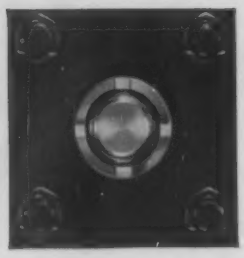
With all the experience in Web Processing these 130 years in business imply

1827 1957

## JOHN WALDRON CORPORATION

*Leader in Web Process Engineering Since 1827*

NEW BRUNSWICK, NEW JERSEY
CHICAGO · LOS ANGELES



# Here are the world's finest power cylinders

# ...competitively priced!

**This ad is written for the man** who has thought all cylinders are "pretty much alike." That just isn't so, and your Hannifin man would like an opportunity to show you why...

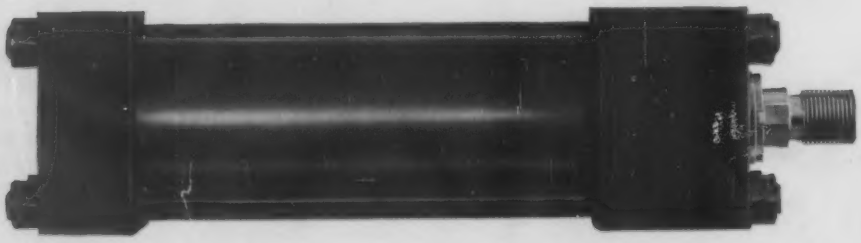
He'll show you design features that other cylinders simply do not have... extra quality workmanship at critical points that pays off in longer life ...accessibility that simplifies their infrequent maintenance. And when he talks price and delivery, you will find these better features cost you no more, can often be delivered sooner.

We think you'll agree that it pays to standardize on Hannifin cylinders.

AIR AND HYDRAULIC

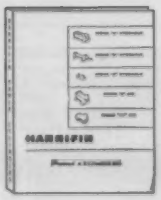
**HANNIFIN**

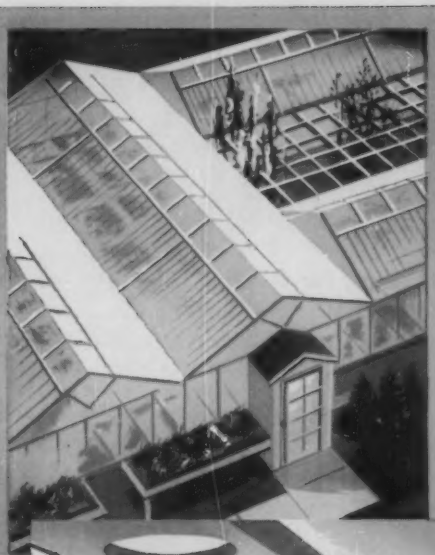
POWER CYLINDERS



**COMPLETE CYLINDER FILE**

Write for your copy of this new Hannifin Cylinder File . . . complete, easy-to-use, easy-to-order-from information on five lines of Hannifin Cylinders. Write Hannifin Corporation, 553 S. Wolf Road, Des Plaines, Ill





From lightweight greenhouse panels to decorative partitions for home and office . . .

Pittsburgh Selectron POLYESTER RESINS

are now ready for a thousand new uses!

PITTSBURGH'S SELECTRON Polyester Resins are playing an important part in the development of new materials for building and decorating. They are being used in the making of clear and colorful panels that have a wide range of applications—from sidelights and skylights of greenhouses to decorative partitions that add sparkle and beauty to office or home.

**SELECTRON Resins give** these panels unusual weather resistance, easy moldability and exceptional light stability. Reinforcing fillers give them exceptional strength with low weight, impact toughness and dimensional stability. Being translucent, these panels diffuse daylight without glare. They possess low thermal conductivity.

**Above all,** these panels are very economical to use. They often cost only half as much to install as conventional materials. They are practically maintenance-free.

**SELECTRON Resins offer** almost endless possibilities to alert, progressive manufacturers. If you are designing a new product—or redesigning one you are now making—SELECTRON may help you make it lighter, stronger, more durable and, probably, at lower cost. We'd be glad to have one of our engineers discuss your problems with you without cost or obligation.

**Send For FREE Booklet!**

• Write, wire or phone today for our new booklet containing description of SELECTRON Polyester Resins and explaining many ways to use them. Pittsburgh Plate Glass Company, Selectron Products Division, Gateway Center, Pittsburgh, Pa.

**Just a few products in which Pittsburgh SELECTRON Resins are now used—**

Aircraft structural parts
Radomes for electronic equipment
Life floats
Ballistic panels
Helmets
Boat hulls
Machinery housing and guards
Trays
Tote boxes
Food lockers
Garbage pails
Baskets for automatic dishwashers
Baskets for automatic washers
Wash tubs
Tool chests
Shipping containers
Instrument cases
Laundry hampers
Kitchen containers
Fishing rods
Sinks
Street signs
Traffic signs
Fluorescent light fixtures
Television cabinets
Loudspeaker housings
Gas meter housings
Structural panels for offices and homes
Door and transom lights
Awnings and canopies
Greenhouse panels
Skylighting
Molded chairs
Prefabricated houses and garages
Truck bodies

PITTSBURGH Selectron

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

The new look in vinyl insulation...

# 3 "Dutch Boy" Lectro Stabilizers ready now for next year's wires

These new Lectro series stabilizers are "Dutch Boy" quality ... made to the same high standards as such proven performers as "Dutch Boy" Tribase or Dutch Boy Dythal® Stabilizers.

Try the Lectro series in your new formulations. We'll be glad to help ... with technical data and formulating suggestions. Just write.

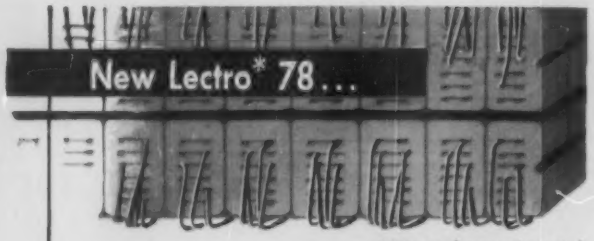
*Trademark

Dutch Boy® CHEMICALS

NATIONAL LEAD COMPANY
111 Broadway, New York 6, N.Y.

In Canada: CANADIAN TITANIUM PIGMENTS LIMITED
630 Dorchester Street, West, Montreal

## New Lectro* 78...



105° and experimental higher rated wire

### Stabilizer for severe heat service conditions

Lectro **78** is a new "Dutch Boy" lead stabilizer developed particularly for high temperature vinyl insulations. Tests indicate (1) it stabilizes against extreme processing temperatures without gassing; (2) it imparts exceptional heat service life.

Lectro **78** sets new highs for volume resistivity over a range of temperatures in tests made according to Underwriters' Laboratory procedures on T, TW, 90°C and 105°C coated wire. In the same series it shows outstanding moisture resistance, as well.

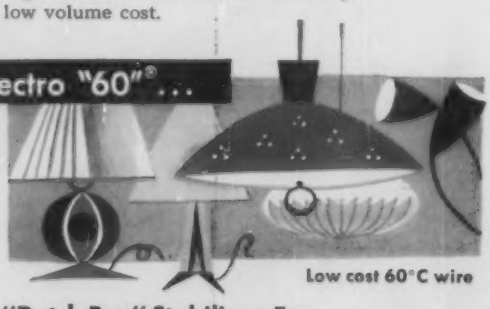
## New Lectro* 77...

Special purpose 60°-80°C wire

### A most versatile insulation stabilizer

Lectro **77** ... another new "Dutch Boy" lead stabilizer ... promises unique versatility. For one thing it is an unsually good stabilizer with phthalate and many special purpose plasticizers. Secondly it provides excellent resistivity and outstanding moisture resistance at unusually low volume cost.

## Lectro "60"®...



Low cost 60°C wire

### "Dutch Boy" Stabilizer. For lowest volume cost

In 60°C wire, Lectro **60** lead stabilizer provides much the same benefits as Lectro **77** ... combined with rock bottom volume cost.

# Save time, money, storage space with—

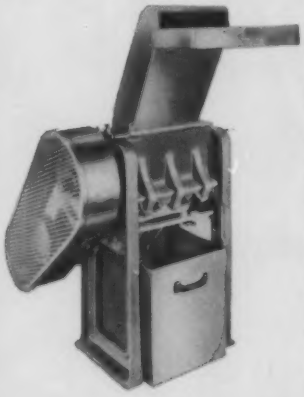
# DE MATTIA GRANULATORS

## PROCESS ALL YOUR SCRAP

right in your own plant! With De Mattia Scrap Grinders in your molding shop you can reclaim all your scrap — large chunks from heating cylinders, accumulations from nozzles and real tough molded pieces — in your own plant, at once. Models for press-side installation save handling and make salvaged material immediately available. There is a De Mattia model for every scrap processing need.

WRITE FOR NEW ILLUSTRATED BULLETINS ON DE MATTIA GRANULATORS AND HIGH EFFICIENCY MOLDING PRESSES — Contain complete specifications on famous DeMattia molding equipment.

### GRANULATOR No. 1



Simple, rugged and highly efficient. Has capacity of 200 lbs. per hour. 3 H.P. Motor with double V belt and Meehanite flywheel. Features high grade roller bearings with positive seal. Four cutting blades placed on a bias permit efficient cutting of thin strips in Vinyl, Saran, etc. Standard screen with ¼" openings (other screen sizes on request). Hopper opening 13¼" x 4½". Floor space required 32" x 44"; net weight with motor (approx.) 800 lbs.

### GRANULATOR No. 3

For low-cost salvage of the large slugs and chunks resulting from cleaning out the heating cylinder, accumulation at the nozzle and also those molded pieces too tough for the average sprue and scrap grinder. Capacity — Over 150 lbs. per hr. 3 H.P. Motor in Base. Double V Belt Drive. Heat treated Alloy Steel Rotor High Grade Roller Bearings with Positive Seals. Standard Screens with 11/32" Openings (other sizes on order). Hopper opening 9" x 4¼".

### GRANULATOR No. 4-A

Recommended for at-the-machine operation. Capacity 75 lbs. per hour; 2 H.P. Motor 1200 RPM; Direct drive; Solid semi-steel hopper; High grade roller bearings with positive seals; Standard screen with 11/32" opening (other sizes on order). Hopper opening 9" x 4¼". Overall dimensions 39" long, 18" wide, 42" high. Net weight 500 lbs. with base.

NEW YORK SALES OFFICE: 50 CHURCH ST.
CABLE ADDRESS: BROMACH, NEW YORK

DE MATTIA MACHINE and TOOL CO.

MIDWESTERN REPRESENTATIVE: E. MATWALD
189 WEST MADISON ST., CHICAGO 2, ILLINOIS

## DE MATTIA MACHINE and TOOL CO.

CLIFTON • NEW JERSEY

# Stevens announces

## HMR-29*... an exclusive

**Laminate tests show HMR-29 woven roving achieves a wet and dry strength up to 94% greater than standard woven roving constructions of comparable weight**

Wet and dry laminate tests made by independent laboratories in accordance with Naval and Air Force specifications prove it! HMR-29 "High Modulus"* woven glass roving provides previously unattainable strength—at a low pound cost!

HMR-29 woven roving wets out quickly and uniformly—avoids resin-rich areas—drapes easily.

Here is the first major advance in woven glass roving. The secret is in the exclusive weave construction—another fiber glass development pioneered by Stevens research. *Write for samples.*

Stevens offers complete ranges of glass fabrics and woven roving in all standard weights, constructions, and widths. Fast delivery can be made from warehouse stocks from coast-to-coast. *If you have a special problem, we will be glad to develop a new glass fabric to meet your requirements.*

Stevens

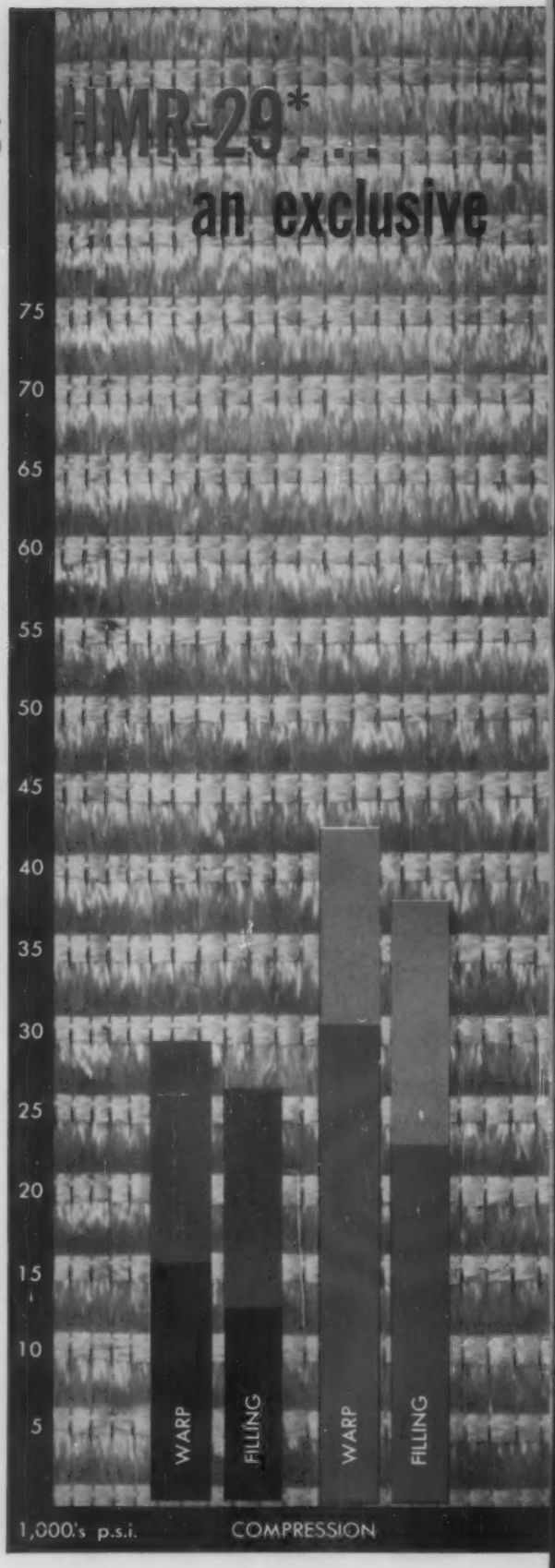
**J. P. Stevens & Co., Inc.**

STEVENS BUILDING, BROADWAY AT 41ST ST., NEW YORK 36, N.Y.

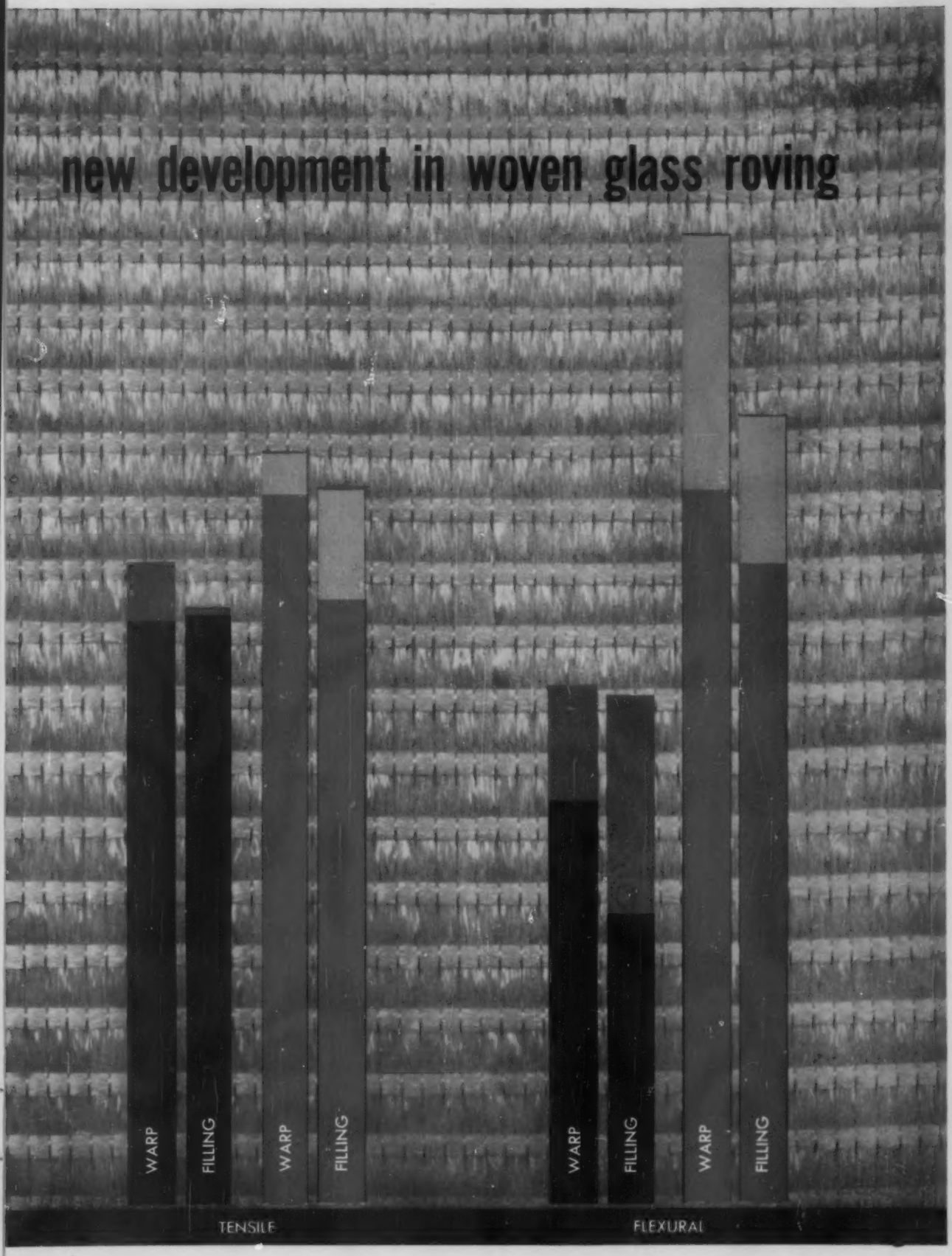
Atlanta • Boston • Charlotte • Chicago • Cincinnati • Dallas
Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis

FABRIC ENGINEERS FOR INDUSTRY

Specifications:
Weight: 28 oz. per sq. yd.
Thickness: .051"
Widths: 38", 44", 50", 54", 60"




*Patent Pending


new development in woven glass roving
WARP
FILLING
WARP
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WARP
FILLING
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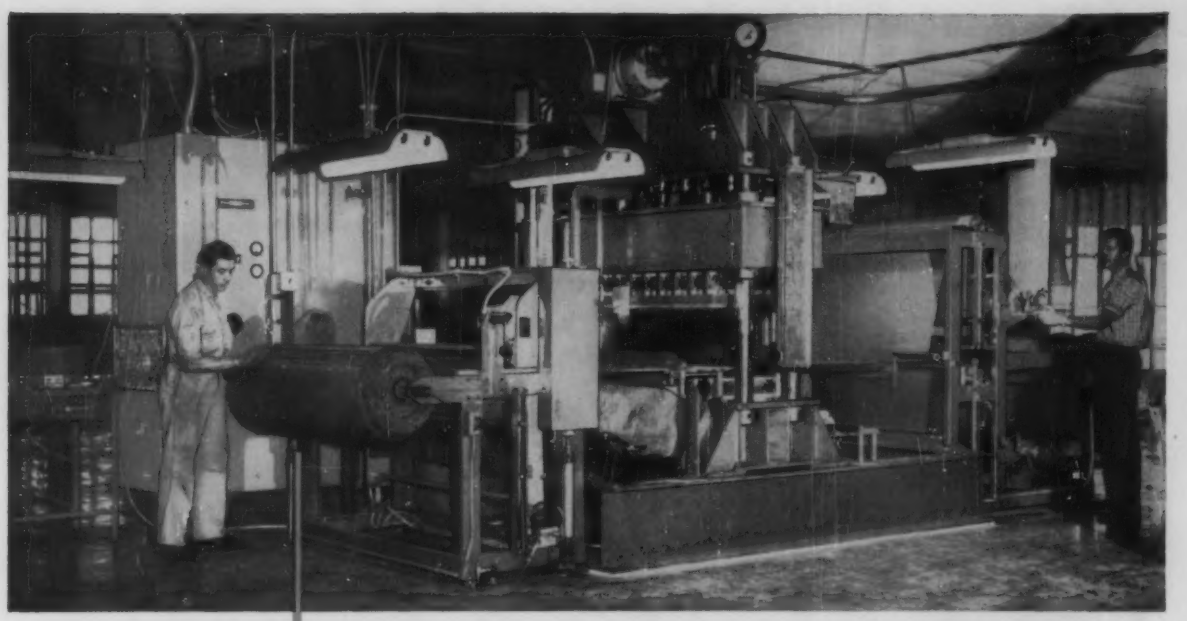

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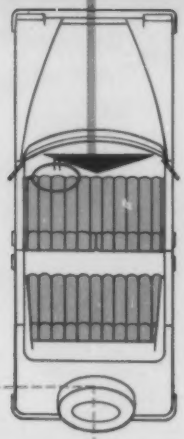

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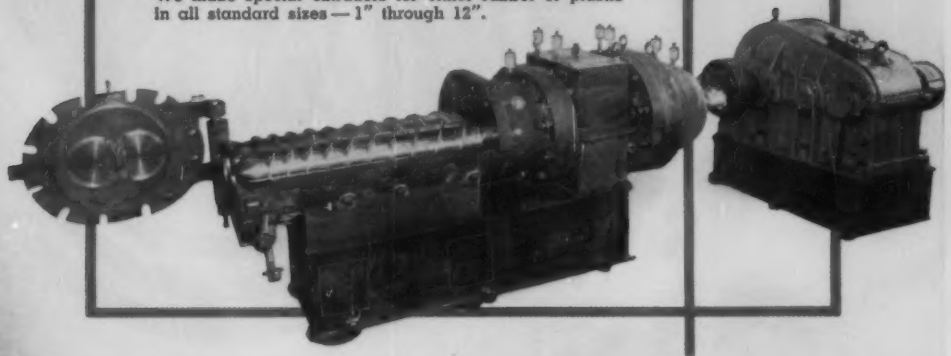

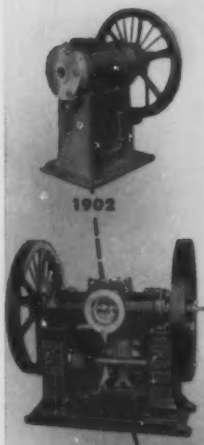


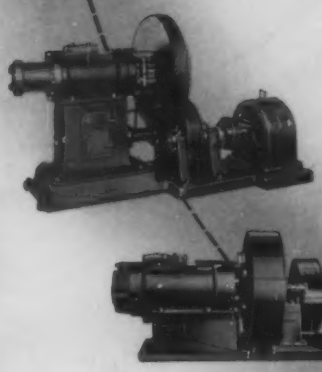

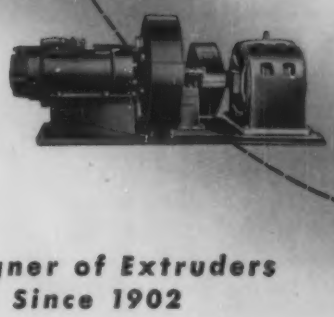

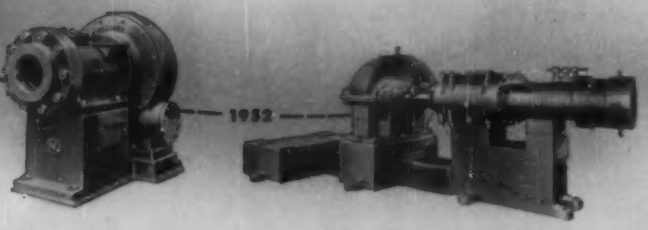


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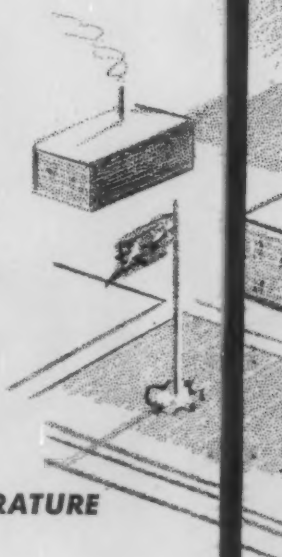

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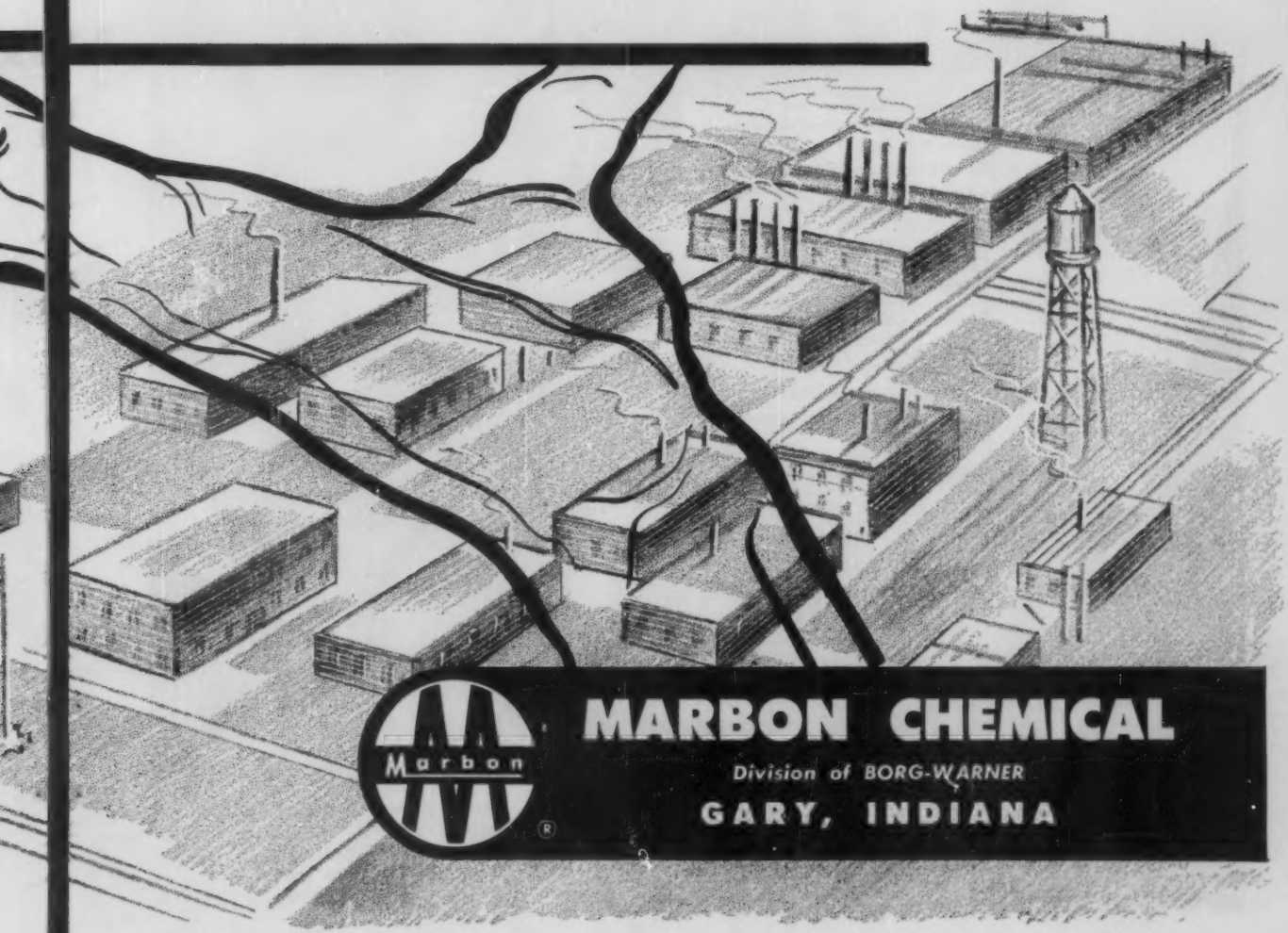

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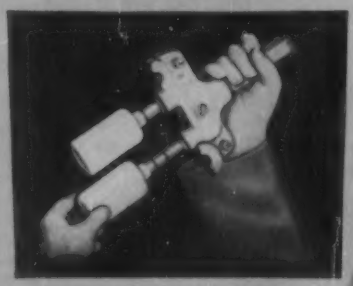

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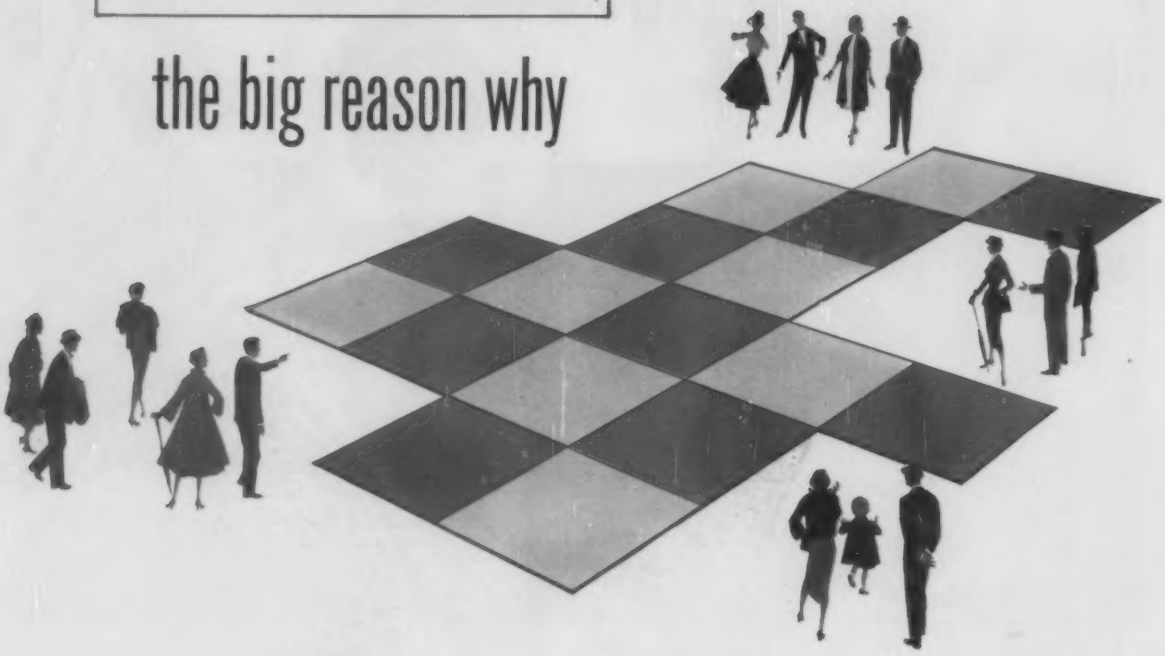

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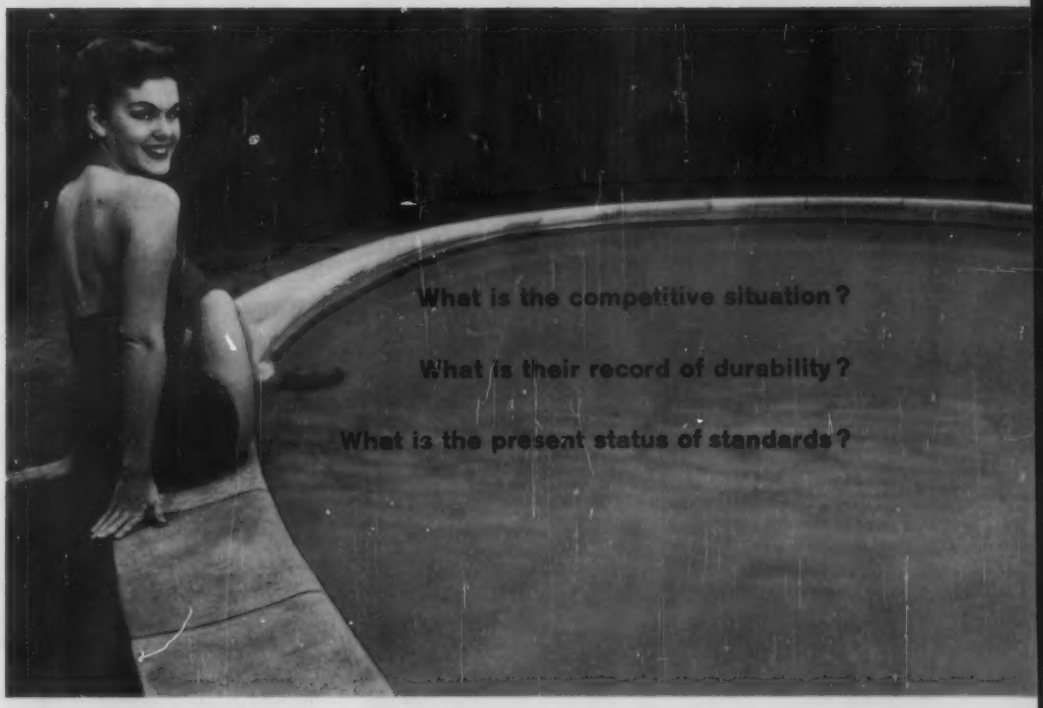
MODERN PLASTICS
Volume 34
August 1957
Number 12

## What is the future for

# R P SWIMMING POOLS?




Photo, Cinderella Glass Pool Corp.

One of the biggest booms in any business in 1957 is in the production and installation of swimming pools. According to Robert M. Hoffman, publisher of *Swimming Pool Age*, there were in the United States at the beginning of this year 89,000 swimming pools as compared with 10,700 at the beginning of 1948. In 1956 33,000 units were constructed, and it seems likely that a total of over 45,000 will be installed during the current year.

Of the 89,000 pools in existence at the beginning of 1957, 57,000 were residential pools. And apparently the same general proportion is being maintained in the 1957 construction. Approximately 30,000 residential swimming pools will be built this year. It is this market for 30,000 residential pools in which the reinforced plastics industry is seriously concerned.

There are four basic methods of building a residential swimming pool. First is poured or

**Jerome Rudolph,** president of U. S. Pool Corp., exhibits model of modular sectional molded pool

**Completed** 32- by 16-ft. reinforced plastics pool is lowered into excavation in Florida. Molded sections, shipped from New Jersey, were assembled on site. (Photos, U. S. Pool Corp.)

cast concrete; second is the pressure-sprayed "gunite" reinforced concrete pool; third is concrete block wall construction with cast concrete bottom or sand bottom covered with a thick waterproof vinyl liner; fourth is the molded reinforced plastics pool.

A survey by *Swimming Pool Age* showed that the pneumatically applied concrete pool accounted in 1956 for 57% of the business and poured concrete for 15%; the remaining 28% was divided among reinforced plastics, vinyl liners, steel, and aluminum.

Reinforced plastics as pool-building materials have gained wide if erratic publicity because the pools can be factory-produced under conditions of quality control, should have very low maintenance costs, do not need to be painted, and will not rust or corrode. Indeed, an implication in much of the publicity concerning reinforced plastics pools is that they can be used in do-it-yourself installations.

#### Not for "do-it-yourselfers"

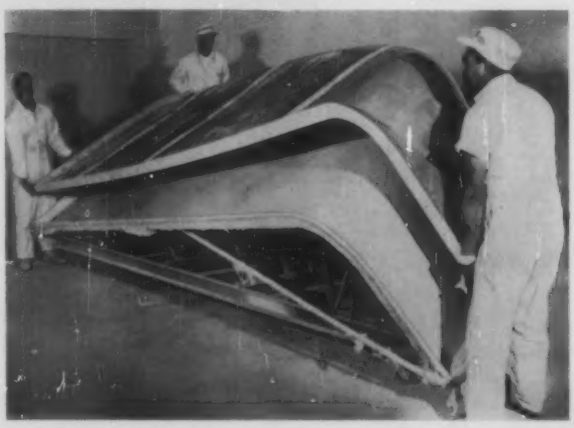
In the opinion of those most closely concerned with the future of reinforced plastics as a material for swimming pool construction the above reasons for its use are valid, but because of the properties of the material and the lifetime economics of a pool, the do-it-yourself angle is entirely wrong.

There are no available statistics on pool failures—which in any material are extremely costly. Those attributable to reinforced plastics are probably no greater in proportion to those in any other kind of material—but they have certainly reached the public ear. One hears, without specific reference, of all kinds of difficulties ranging from surface cracking or discoloration to bulging or leaking.

Yet since January 1955, some 1600 reinforced plastics pools have been installed and MODERN PLASTICS has been able to confirm only two real failures, both of which were caused by the owners emptying the pools, causing them to be lifted by hydrostatic pressure in the ground.

Quite a few of the early pools, of course, had to be repaired and patched, sometimes because of too-thin construction, bad lamination, or improper gel coating, sometimes (and much more frequently) because of improper installation. Some unreliable manufacturers have been in

**Molded** swimming pool component is removed from mold. (Photo, Cinderella Glass Pool Corp.)

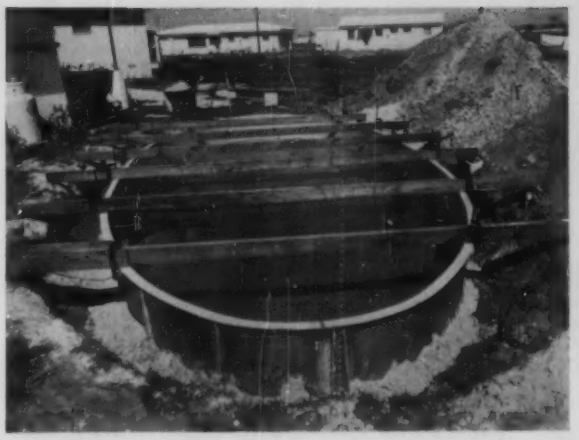


**In one method** of installation, molded sections are overlapped and bolted in excavation. Workman is drilling holes for bolts

**Same** pool, three-quarters complete

and out of the reinforced plastics pool business; and when a company, having made an expensive installation, folds up, and then the pool fails, the customer is left "low and dry."

Every polyester material maker, every producer of fibrous glass, the editors of MODERN PLASTICS, and the architectural and construction and swimming pool magazines are today being bombarded with questions. These come, first, from people who want to get into the business of making or distributing swimming pools and second, from consumers who are considering the purchase of a pool but have heard the above-mentioned sad rumors.



**Bolted pool** is beam-jacked and held level while stabilized sand is poured in for backfill

### Where the situation stands

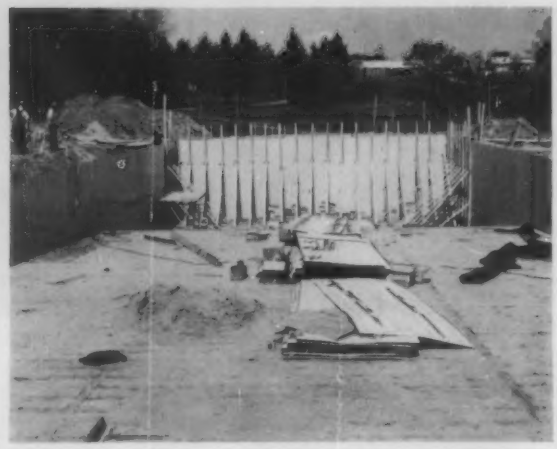
With a view to setting forth the situation as it stands today in a boom period when the whole reinforced plastics swimming pool business is being scrutinized and its products evaluated, this article will illustrate the different types of pool constructions presently in use.

An organization of swimming pool manufacturers has been formed called The National Swimming Pool Institute with offices in the Harvard State Bank Building, Harvard, Ill. This organization is currently working on the development of standards for all kinds of pools with a specific standard for the reinforced plastics types.

While there are probably a dozen companies manufacturing these pools today, the main producers are W. R. Chance & Assoc., Arlington, Va.; Cinderella Glass Pool Co., Los Angeles, Calif.; Paradise-Delorich, Inc., N. Miami, Fla.; and U. S. Swimming Pool Corp., Scotch Plains, N. J. Several companies, including An-

**Installation** is complete, except for the coping operation. (Photos, Paradise-Delorich)

**Building** a pool with reinforced plastics panels. Here three sides have been erected



**Walls** are supported on inside while backfill is poured

thony Fiberglass Pool Corp., South Gate, Calif., and Popular Fiberglass Products Co., E. Northport, N. Y., are manufacturing wading pools in one piece, but these are not germane to the present discussion.

Both Chance and Cinderella manufacture residential pools called "sectionals." If an eggshell were divided lengthwise and one half of it were again divided into four pieces, each piece would represent a pool section.

Each section is molded with a flange vertical to the outside surface of the piece and the four parts are bolted together by means of the flanges with a compressible gasket and a resin facing. In this type of installation the pool is assembled outside of the excavation, frequently above it (since the work must be done underneath), and lowered into position, after which backfill of stabilized sand, composed of one part cement to seven parts sand, is poured and tamped into place.

Paradise-Delorich, Inc., which manufactures the Paradise Pools, favors lap-type construction, using bolts and epoxy adhesives, rather than the flange type. The Paradise Pool is constructed inside the excavation.

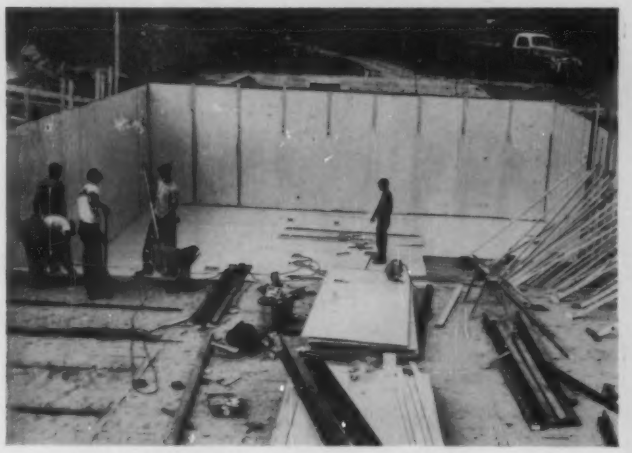
U. S. Swimming Pool Corp. uses both methods. On some of its standard smaller pools the company uses flange bolting: on its freestyle pool, which can be made any length by adding center sections, it prefers the lap-type construction. In addition, it manufactures one-piece pools, 10 ft. 3 in. by 25 ft. in size and with depth from 2½ down to 5½ ft. for the small property owner. This company has applied for patents on a new type of square pool construction, in which is used a composite panel 2½ in. in thickness that can be shipped by common carrier at low cost and handily bolted together at time of installation.

#### Fabricated on the job

A completely new approach to reinforced plastics pool construction, declared to be most suitable for large public pools, was developed by Paradise-Delorich, Inc., first for the Red Lion Country Club, Red Lion, Pa. The pool is rectangular, olympic size, 92 ft. long, 36 ft. wide, from 3 to 11 ft. deep, and was built of reinforced plastics panels 4 by 12 ft. butt bonded with epoxy resin. The panels are ⅜ in. thick and are reinforced with additional layers of glass roving and polyester plus ribs for added strength. In building this pool, an underfloor was constructed of 2 by 4's on 6 in. centers, between which were placed sandbags filled with sand, tamped down to prevent shifting. The reinforced plastics panels were screwed to the wood and the seams butt joined with epoxy. Where walls and floor meet, reinforced plastics angles were placed behind the panels and the seam filled with an epoxy resin core having a 3-in. radius.

The backfill around the walls was made of a 1:10 mix of concrete with iron angles extending down from backfill into a concrete footing to provide firm support.

Relative cost estimates were made on this pool. Taking the cost of a steel pool of the same size at 100%, aluminum would cost 85%, sprayed reinforced gunite concrete 75%, rein-



**Floor** is installed on top of two-by-fours

**Sides** and floor completed. (Photos, Paradise)

forced plastics 55%, dry-packed concrete 55%, and concrete blocks lined with vinyl 40%—but it is declared to be very doubtful whether this latter type would stand up to the pressures in this size pool.

In present reinforced plastics pool construction—whether one piece, sectional, or panel, or whether bolted flange or overlap—the key to success is in the quality and density of the laminate, the care with which the colored gel coat is made part of the laminate, and (most of all) the carefulness of the installation.

Installation costs in most parts of the country, aside from excavation but including assembly, installation of accessories such as filters, lights, etc., and mixing and setting and tamping of backfill, range from 25 to 35% of the total cost of the pool. This means that false economy in installation is to be avoided.

#### Temptations to be avoided

There is a great temptation on the part of pool dealers and installers to promote two-day reinforced plastics pool construction and there is a temptation to pool shell makers to get pools out of the plants and into use as quickly as possible. Open-end mortgages and long-term bank financing are available to home owners and dealers—and it is the relative ease of financing which partly accounts for the boom in pool building this year.

Three most obvious things are essential if this business is to progress in pace with our present economy: First, standards of thickness, density, hardness of cure, finish, and outside protection against backfill stabilizer chemicals must be established. Second, installation standards must be established for each type of pool so that there will be no voids between backfill and pool shell, so that there will be no chance of the pool settling, so that hydrostatic release valves shall be provided to prevent uplift when the pool is emptied for any purpose. Third, distribution of pools through installing-dealers must be handled in such a way that responsibility for the final job will be firmly established. The dealer should be in a position to supply a written guarantee clearly describing his responsibility for performance of the pool over a period of at least five years. Indeed, the dealer's construction contract might preferably provide for an annual service contract covering minor repairs and maintenance on a reasonable annual basis.

Finally, as was discovered in the boat business, in the auto body business, and in many other fields of reinforced plastics application, the swimming pool industry will have to promote its markets, not on the basis of low cost, but on the basis of top quality. And a top quality reinforced plastics pool, properly installed under guarantee will generally cost as much as a pressure-sprayed gunite pool. However, the reinforced plastics pool will have much lower maintenance costs since it will not need to be painted. It will be easier than any other type of pool to clean. It cannot rust or corrode. It should last a lifetime.

# Glamor for aerosols

*Molded nylon bottles are being aimed at the very top luxury bracket of the disposable container market*

**Machined prototype** illustrates design possibilities for blow molded nylon aerosols. Pinched sides give visual appeal, assure good grip, and provide convenient labeling space. (Photo, E. I. du Pont de Nemours & Co.)

While polystyrene is chipping away at the low-cost end of the disposable container market, nylon is being aimed at the very top: aerosols for the luxury trade. These are designed for packaging such personal products as colognes, hair lacquers, antiperspirants, antibiotics, and the like.

Nylon in this application is admittedly expensive, but it offers style (in terms of a wide range of interesting molded shapes), rich colors, and an attractive texture. Nylon aerosols are also safer than those of vinyl-coated glass which currently occupy the top price bracket in the field, since they won't shatter on the bathroom floor.

The big push in nylon aerosols is coming from Du Pont. The company brought out Zytel 42, a new formulation of nylon 6/6 with a viscosity tailored for blow-molding, and then molded sample runs of bottles in its own laboratory to create interest among fabricators, with notable success.

Another development which makes the nylon bottle even more attractive is the perfection of the "spin welding" technique of joining together two injection molded halves to form a complete bottle. Since the halves are separately molded, very striking two-color effects are possible. As the name implies, the method uses frictional heat, generated by the rotational rubbing of two surfaces, to melt and join them together. The technique works with acrylic and polyethylene as well as with nylon.

### Production runs

Several fabricators have already made production runs of nylon bottles, and they report that virtually every manufacturer of personal products is at least looking into the possibilities of nylon aerosols. Colgate-Palmolive Co. is test marketing an injection molded aerosol container for its Veto mist antiperspirant.

At the Chicago packaging show in April, two companies showed nylon bottles in an actual filling operation. National Plastics Products Co., Odenton, Md. filled a two-color injection molded bottle and Continental Can Co.'s Plastic Container Div. used a blow-molded container. National Plastics fabricated about 8000 bottles for the demonstration line; Continental Can, 3500.

Precision Valve Co., Yonkers, N.Y., has

**Design** for aerosol container shows extreme curvatures possible with nylon bottles made of injection molded sections. Base of container is attached by spin welding or other means. (Sketch, Du Pont)

**Two nylon bottles,** each made by spin welding two injection molded sections together. Bottle at extreme left has been vacuum metallized, bottle at right in the photograph has grey and pink parts

been working on a nylon aerosol for some time and is set up to produce some 50,000 units a day for interested users. This company, a leading valve supplier to the aerosol industry, is primarily interested in fostering the cause of aerosol packaging.

Other manufacturers now working on nylon spray bottles include Imco Container Corp., Kansas City, Mo.; Precision Extruders Div. of Lamex Chemical Corp., Manchester, N.H., and Plax Corp., Hartford, Conn.

#### Costs are high

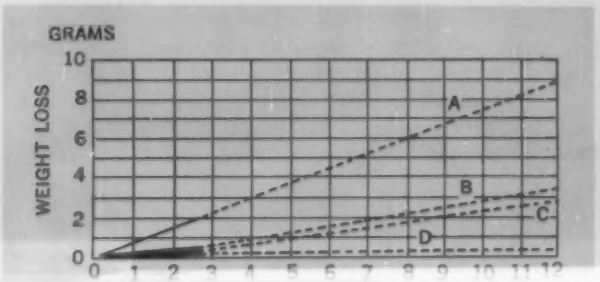
A nylon container is considerably more expensive than either glass or metal. At this stage of development, costs are difficult to estimate, but 4-oz. bottles such as those made by National Plastics Prods. or Continental Can use about 1 oz. of nylon per bottle for a material cost of 8½ cents. Finished nylon containers of this size are estimated to cost from 16¢ to 19¢, on a production basis.

Precision Valve Co. figures on a price of between 15¢ and 17¢ for a thinner-walled 3-oz. bottle (30 to a pound of nylon molding material) based on a production run of half a million units or over.

In contrast, the vinyl-coated glass bottle supplied by Wheaton Glass Co., Mays Landing, N.J., costs 8½¢ for the 2-oz. size and 10.3¢ in the 4-oz. size.

Aerosol containers made of metal cost roughly from 3 to 5¢ a unit, with the higher price including printing costs. Two cost factors work in favor of nylon aerosols: lower shipping weight and the fact that they are virtually unbreakable. Because of this factor the bottles can be "tumble packed," making for lower handling charges. These considerations, of course, do not balance the higher container costs. But any costs are, of course, justified if they move the product off the retail shelves; that's the main reason for inventing the aerosol in the first place.

**Weight change** versus time for various products contained in nylon bottles of 50-mil wall thickness: A—shampoo; B—hair lacquer, C—cologne, D—propellant. A shellac-based hair lacquer and two anti-perspirants were also tested, but showed no essential change in weight (Data, Du Pont)




**Blow molded** nylon bottles burst only under extremely high pressures, but do not shatter. Average short-time burst strength for nine bottles such as those shown (33- to 40-mil wall) was 314 p.s.i.g.

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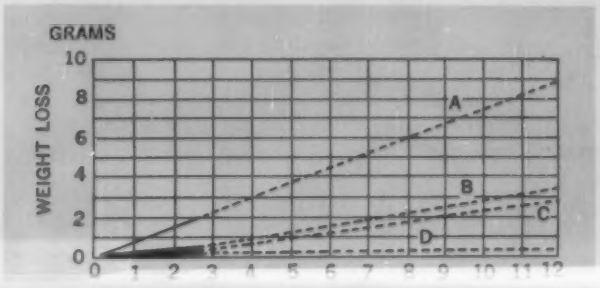


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# JET AGE

**U. S. Navy** jet acrobatic group, wearing revolutionary crash helmets. (Photo, official U. S. Navy)

Key to the dramatic success of the new APH-5 aviators' crash helmet, now being used by the U. S. Navy is found in a number of plastics applications. The exacting requirements of high-speed flight necessitated a revolutionary design employing a new concept in head protection.

This concept, which involves the absorption of impact energy by the crushing of a rigid cellular material, is implemented by the use of an expanded polystyrene.

The complete helmet is an integrated assembly of shell, visor, communications equipment, and attachment for an oxygen mask. It is an intricate structure that contains a surprising total of 105 parts, the most important of which are plastics.

*Mine Safety Appliances Co., Plastics and Rubber Laboratory, Pittsburgh 8, Pa.

The shell is a molded laminate of glass fabric and high-impact polyester resin. The lay-up of the impregnated fabric is made in a bench fixture and then transferred to the two-part machined steel mold. A carefully worked out graduation of plies yields a shell which has the required rigidity and penetration resistance yet does not offer sufficient resistance to flexing of the side portions to cause difficulty in donning or doffing.

### Controlled molding

Pressure for molding is exerted by a conventional type of inflated rubber bag. The molding procedure is carefully controlled to keep the number of air pits in the external surface to a minimum.

The molded shells are then sprayed with primer, any pits are filled, and a special gold

# CRASH HELMET

*Twelve major plastics components are involved in new concept of head protection*

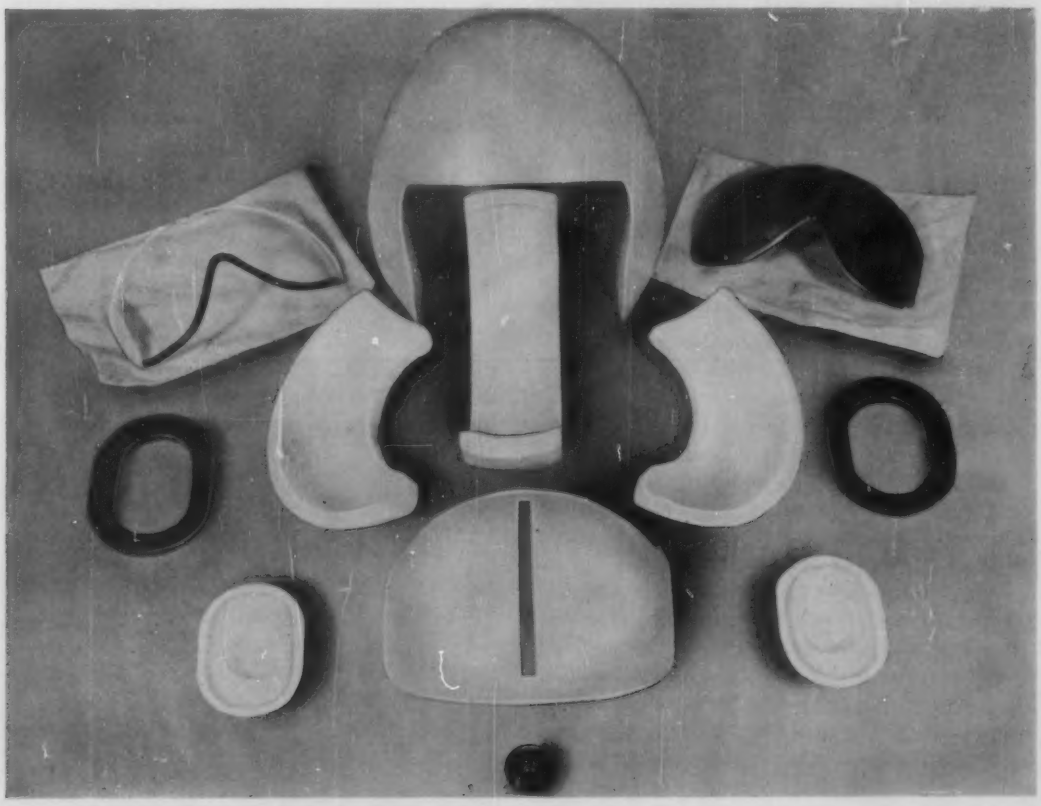
coating is applied. A transparent protective lacquer adds the finishing touch.

The helmet is next fitted with the visor housing assembly, which covers the visor when the latter is in its retracted position. It is also a glass reinforced polyester part and either glass mat or an air-felted glass preform may be used to mold it. The same polyester resin used in the shell is employed in the housing, and the final finishing system is the same.

A center slot, required by the visor actuating and locking mechanism, is molded into the

**Side and front** view of complete helmet

**Disassembled helmet,** showing plastics components. (At top right is tinted visor)



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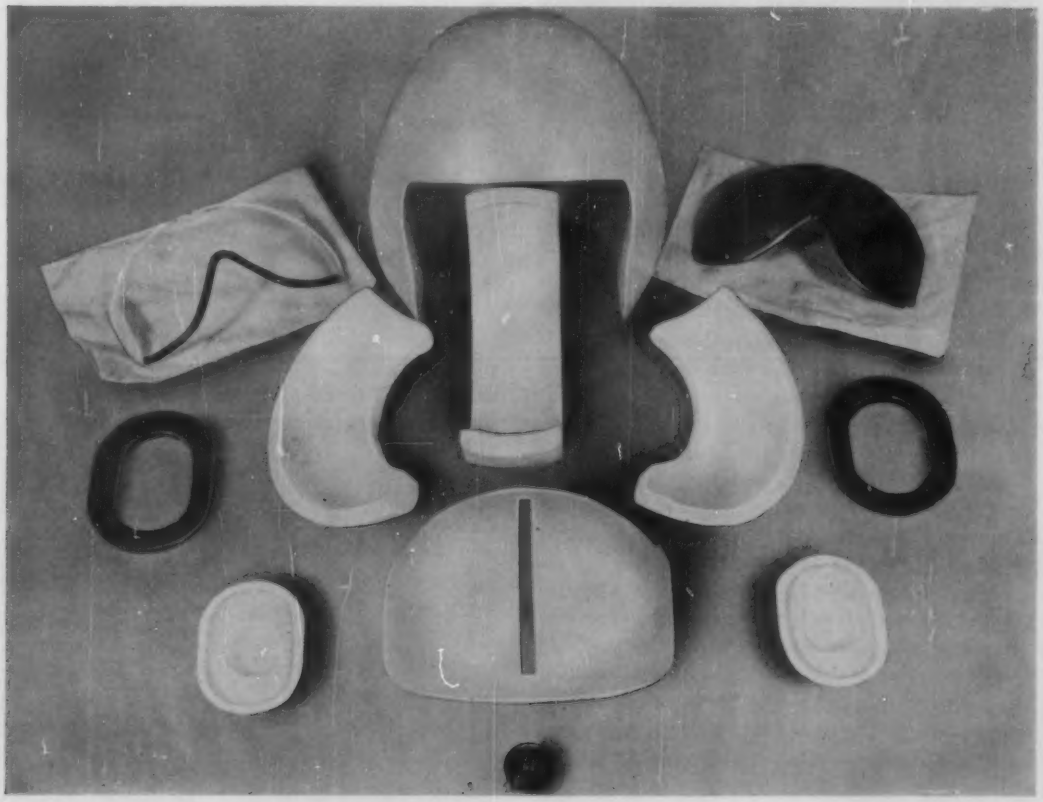


**Polyester resin** is added to fibrous glass preform in visor housing mold

**Molded visor** housing, ready for removal from mold. Note molded-in center slot

housing with a very close dimensional tolerance. This tolerance must be maintained in the finishing of the slot edges for proper function of the visor locking device.

To move the visor up or down, the pilot depresses a nylon button that projects above the visor housing. This button is injection molded from navy blue material, chosen for its abrasion resistance. When the pilot pushes down on this button and rotates it a half turn, the visor can be slipped out easily for replacement.

Two types of methyl methacrylate visors are used — clear and tinted. Both are blown to obtain a predetermined degree of stretch orientation, which increases the flexural and impact strength. The sheet used in the tinted visor incorporates a finely divided black pigment. Graduated light transmission from top to bottom is obtained by a forming method that results in a graduation of thickness.

The importance of fine optical properties in these visors is understandable when their use is considered. Imagine, for instance, the visual demands on a jet pilot landing an 8-ton plane at 130 m.p.h. on the heaving deck of a carrier. The landing deck must be exactly where it appears to be! If not, the result may be a tragedy.

After the visors are trimmed to shape, a glass fabric reinforcement is cemented to the lateral edges. Guide slots are machined into these reinforced areas and a keyhole cut in the top of the visor for attachment to the button assembly. Lastly, a vinyl trim is affixed to the bottom edge.

### Energy-absorbing liners

The three-part energy-absorbing liners of the helmet shells are made from a special formulation and density of expanded polystyrene. The three individual pieces, of uniform thickness, are cemented to the inside of the shell. Previously, fliers' helmets were made with cradle-type suspensions. These suspensions tended to "wobble" at times when helmet stability was critical; in addition, pilots often readjusted the cradles, thereby losing much of the available protection. Expanded polystyrene eliminates both difficulties.

These liners have been found to afford the

**Formulation** for producing polyurethane foam ear pads is charged into aluminum mold

**Water** is added to expandable polystyrene beads in mold for making earphone retainers

**Foamed** styrene earphone retainers are removed from mold. (Photos, Mine Safety)

pilot a remarkable degree of protection from impact hazards. The patented idea of absorbing energy through the crushing of a material of this general character was first worked out for this helmet.

To fit the helmet to the individual flyer's head, neoprene foam sizing liners of the correct thickness are inserted and held firmly to the polystyrene by means of a pressure-sensitive adhesive.

#### Polyurethane ear pads

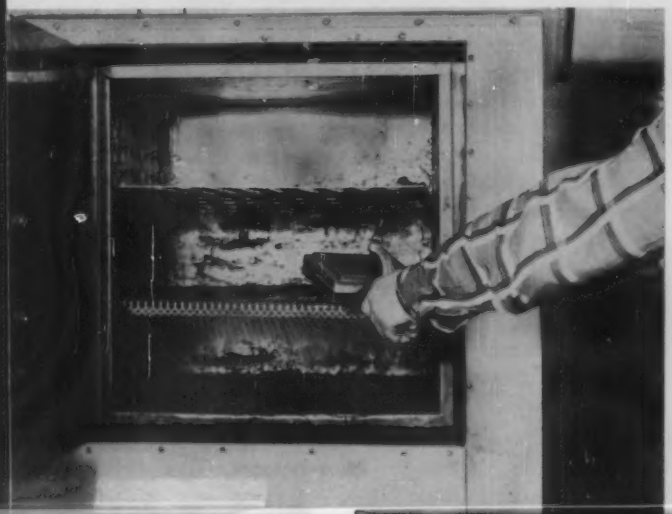
In the earphone assembly, the outer ear pad is made of expanded flexible polyurethane. This material has a slow recovery that gives it a low "pressure-discomfort" factor; in other words, when the specially formulated polyurethane foam is defoamed in use, it exerts a minimum of back pressure against the wearer's head. By absorbing external noise and preventing its transfer to the ear, the polyurethane increases the intelligibility of the earphone communication.

The foamed ear pad is the most difficult of all of the helmet parts to make. Only the most precise control of the ingredients and the procedure of foaming make the manufacture of this item practical. The two ingredients of the formulation are combined in a few seconds and quickly charged to an aluminum mold. The mold is then placed in an oven until the foaming and curing are complete. After air-cooling, the parts are removed. In the assembling operation, they are cemented to adjacent neoprene cushions.

On the other side of the neoprene cushion in the earphone assembly is the earphone retainer. This part is molded from expandable polystyrene beads. A measured volume of water is charged to the brass molds to implement heat transfer and bead expansion. The earphone is held in this retainer with a friction fit so that it can be readily removed for servicing whenever necessary.

The complete helmet is an attractive combination of gold exterior with dark blue trim. It was accepted by the Navy only after being subjected to exacting tests for impact strength, penetration resistance, stability, sound absorption, optics, wind blast resistance, and communication intelligibility. Each one of these important properties was achieved only through the use of a specific type of plastic.

**Charged mold** is placed into oven where it remains until foaming and cure are complete



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# Overcoats for hot pipes

*Reinforced plastics shell prevents corrosion of underground hot-water and steam pipes*

**Pipe insulated** with fibrous glass is protected against corrosion by outer jacket of polyester-impregnated glass cloth

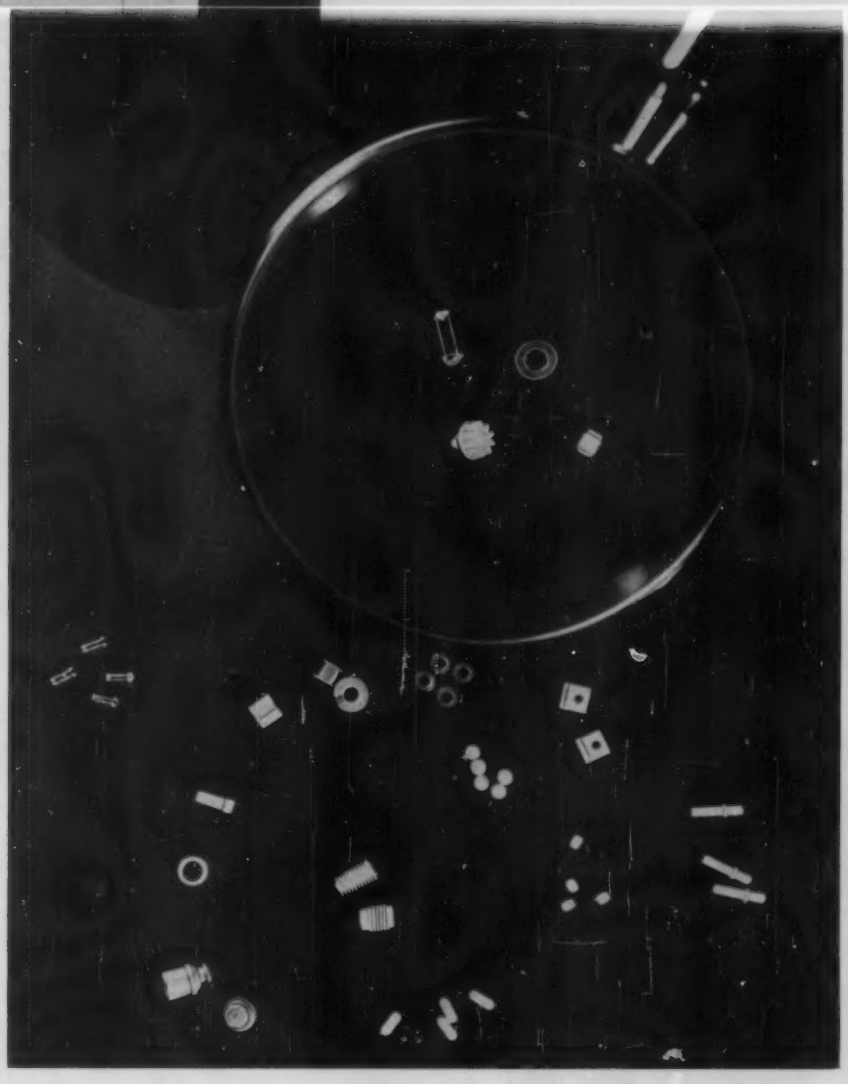
**Section** of pipe, showing insulation and reinforced plastics outer skin. (Photos, American Cyanamid Co.)

**Outer** jacket extends and is bonded to bare pipe, keeps insulation dry during pipe installation

New low-cost, prefabricated insulated pipe has proved effective in protecting steam and hot-water systems from corrosion. Fully tested, called Temploc, and produced by Temploc, Inc., Baldwin Park, Calif., the pipe and its fibrous glass insulation are protected by a strong jacket of spirally-wrapped glass cloth and American Cyanamid Co.'s Laminac polyester resin. Built up of two plies of cloth and resin over a sheath of kraft paper, the protective shell is not affected by moisture or corrosive electrolytic action of the earth, which have destructive effects on the two types of insulated conduit formerly considered standard for underground hot-water systems: corrugated galvanized steel and tar.

Initial cost of Temploc insulated pipe is reportedly about 20% less than steel while its weight is about 50% less than steel and 25% less than tar coatings. Thus, important savings in shipping and handling are made possible by the reinforced plastics protected pipe, but without sacrifice of strength. The plastic outer shell is itself strong enough to resist bursting in a low-pressure system.

The new system of pipe protection is a development of Jack Wilson, Temploc's vice-president, who became interested in reinforced polyesters when he saw boats being molded of the same material. Having proved to himself that reinforced plastics are corrosion resistant and hold up well underground, he went on to make another constructive innovation: sealing and vaporproofing the insulation at the time of manufacture by extending the outer protective shell over the end of the insulation and bonding it directly to the bare pipe. By this means, if a rainstorm occurs while an installation is being made, the fibrous glass insulation remains dry and undamaged even if the ditch fills with water.



# No minimum size

*The smallest things in plastics are molded individually, in single-cavity molds, on fully automatic machines, and to very close tolerances*

Plastics parts so small that it may take as many as 100,000 of them to weigh a pound are being injection molded today, with production tolerances as low as 0.002 inch.

Electrical components are the largest single use for these tiny parts. Other uses include such industrial items as gears and pinions, timing cams, coil bobbins, fastening devices, electric toy train components, automobile parts, and many more. A unique position in this field of molded miniature parts is held by Gries Reproducer Corp., New Rochelle, N.Y. A real specialist in miniaturization, the largest part this company turns out weighs 0.03 of an ounce.

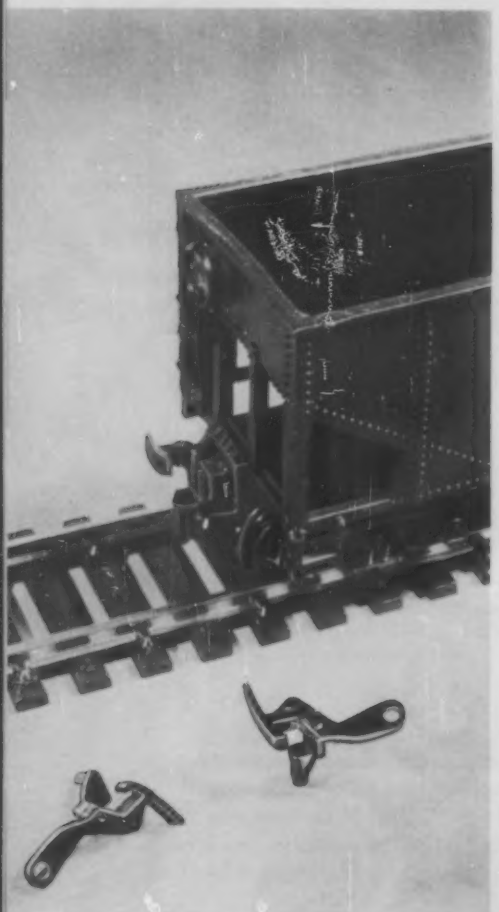
And there is no minimum size. G.R.C. engineers boast that they have been able to make the smallest part a customer has ever ordered.

**Double-handful** of typical parts made by specialist in miniature molding. Light-colored smaller items are electrical switch insulators, of which it takes 20,000 to make a pound. Larger part is car distributor insulator

**Tiny molded** nylon gears and worms go into a variety of products, such as timing apparatus in electric ranges, automatic washers and dryers, alarm clocks, and others

and will make them even smaller when the need arises, almost to infinity!

Gries Reproducer started about 30 years ago as a supplier of metal casting machinery and later specialized in miniature zinc castings. Last year the company produced more than a billion tiny parts of plastic and metal. The firm began using plastics for some of its small parts right after World War II, to get results metal could not provide—notably high dielectric strength, insulation value, resistance to corrosion (even in salt atmosphere), and light



**Intricately-shaped** tiny toy-train couplers are molded of abrasion-resistant nylon. (Photo, Gries Reproducer Corp.)

**Small parts** and accessories for toy train are injection molded of various plastics: 1—red nylon directional signal; 2—gray polystyrene milk can; 3—clear polystyrene rear light; 4—pole mounting cap for top of car; 5—black nylon grab handle for work car; 6—clear polystyrene dummy headlight; 7—clear polystyrene car window; 8—black nylon coil check; 9—nylon track connection pins; 10—nylon coupler head

weight. The company molds all the thermoplastics, but nylon is by far the most important material because of its high physical strength and self-lubricating quality.

**Completely automatic molding**

The most unusual part of the Gries operation is the molding process. Very small, completely automatic injection molding machines, designed and built by the company, are used exclusively. Shot capacity is one of G.R.C.'s many secrets, and cannot be compared with the capacities of conventional commercial equipment. Unattended except for material-feed and the removal of finished pieces, the special presses knock out cooled and ready-to-ship parts roughly once every other second.

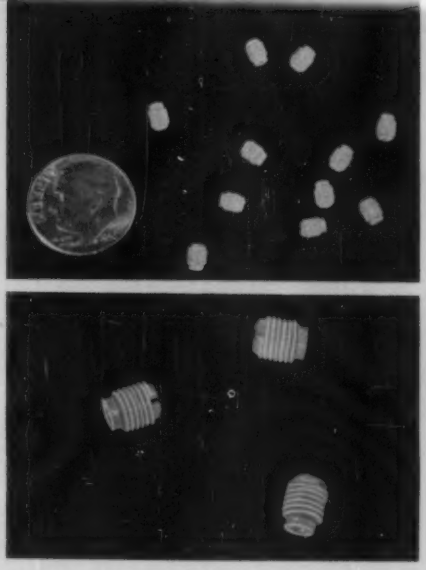
With such small pieces, it would be expected that multiple-cavity molds which reach the upper limits in number of cavities would be used. Just the opposite is true. The company turns out virtually all of its plastics parts in single-cavity molds.

There are several reasons for this seeming anomaly. First, stress is placed on uniformity. When a customer places an order, he can count on each part being identical; if one part is off by as much as 0.002 in. from specifications, on any dimension, all parts will be off by the same amount because they are produced in the same cavity. The buyer can either compensate for the difference, if possible, or the supplier will make the correction in the mold. Precision molding is most important, of course, when the plastic part must closely match other parts of an assembly which are not always of plastics.

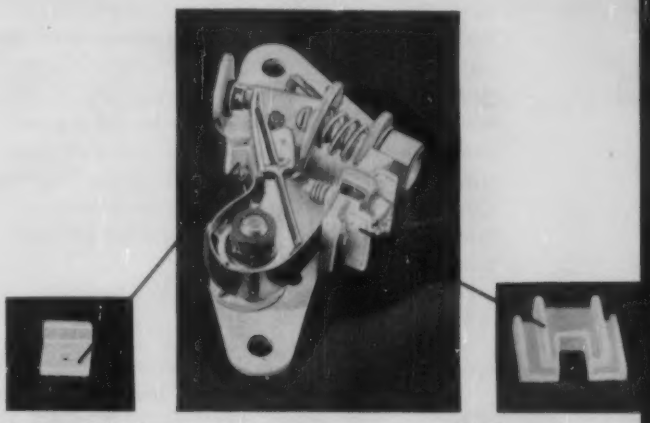
**Material economy**

Another benefit of single-cavity molding is material economy. When very small parts are produced in a multiple cavity mold, it is not unusual for sprues and runners to out-weigh the parts on the order of 10 to 1; thus the greater part of the material going through the machine must be reworked several times. This is costly in terms of time, power, and labor, and presents problems of material degradation.

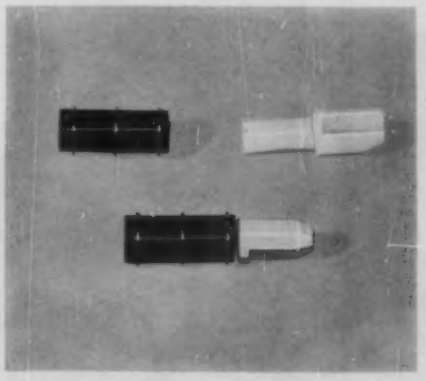
Tolerances on molded plastic parts are held to 0.004 in. on parting lines and 0.002 in. off parting lines. Gate vestige (where the part is formed from the runner) appears somewhere along the parting line, a maximum of 0.005 in., and Gries advises designers to allow for the gate where the tolerance is least important. Closer tolerances than these can be held but costs mount rapidly with each (*To page* 192)



**Miniature** pivot adjusting screws (compare size with dime in top photo) are fully threaded (see enlarged view at bottom). It takes about 21,000 pieces to make one pound



**Automobile** distributor incorporates two tiny molded nylon parts: rubbing block (left), which lifts distributor points to open and close them 100,000 times per min. at 60 m.p.h., and insulator (right)



**Electric** razor plug has two molded nylon parts

# New product needed new

*Unique dispenser for water-conditioning solution in automatic washer called for material with special properties*

An Illinois inventor had a basically sound idea for a new device to greatly increase the operating convenience of automatic washing machines. Appliance engineers adapted it for production by injection molding and specified a new styrene formulation particularly well suited to the application. Result: one of the "hottest" new products to hit the appliance field in many a year.

The story began when Loyal Tingley combined two pie tins and a small tuna fish can to produce a crude but effective accessory unit for introducing a water conditioner into an automatic washer during the rinse cycle. He developed the dispenser in response to his wife's plea for a device which would perform this chore automatically. The inventor then sold the basic idea to Norge Div., Borg-Warner Corp. He is assured a $50,000 guarantee and additional royalties may earn him considerably more than that initial amount.

Although Tingley's original dispenser wheel performed capably, it had to be streamlined into a colorful, handsomely styled unit which could be produced efficiently in large quantities. Molded plastics, using a new high-impact, heat-resistant type of styrene, proved to be the answer.

**Fits earlier models**

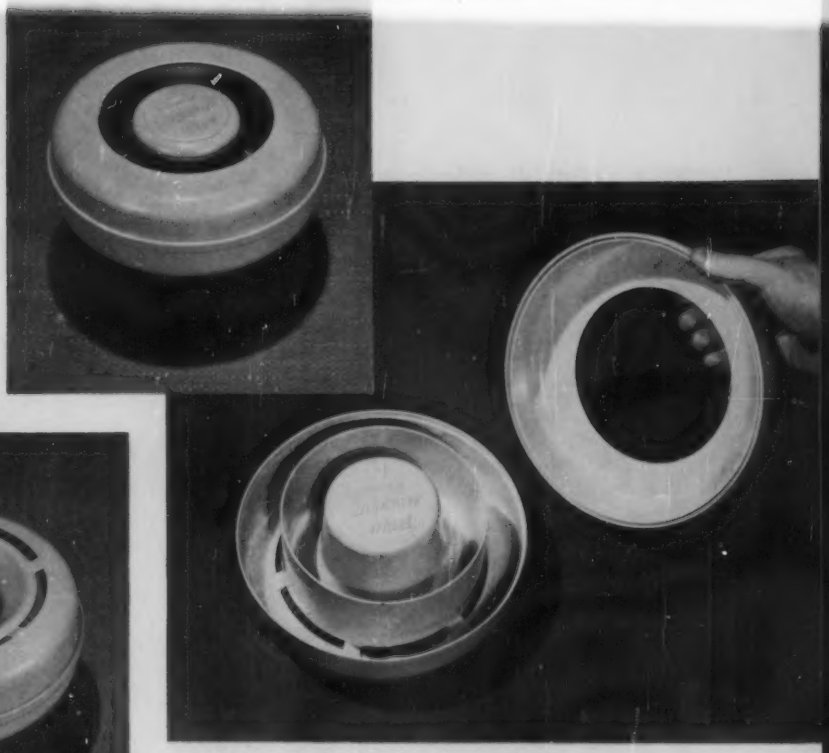
The new Dispenser Wheel is furnished as optional equipment with all 1957 model Norge automatic washers and will also fit earlier machines. Actually a ring-shaped container fitting on top of the agitator, the unit has a filling receptacle in the top and dispensing slots in the bottom. The function of the device is to retain the water conditioner during the washing cycle and release it automatically at the proper time.

Operation of the dispenser wheel depends upon centrifugal force. The unit has an internal rib or baffle which divides the base of the ring

**Washing machine** accessory fitting on top of agitator automatically dispenses water-conditioning solution during rinse phase of washing cycle; unit is molded of high-impact, heat-resistant polystyrene

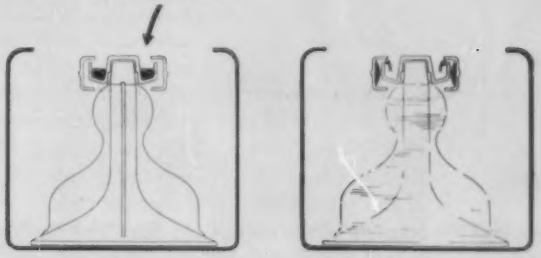
**Original** home-made dispenser (top) consists of pie tins and tuna fish cans present-day version (bottom) is handsome, sleek, rugged injection molded item

# styrene



**Top, bottom, and inside** views of Dispenser Wheel. Slots serve as openings through which water conditioner discharges automatically. (Photos, The Dow Chemical Co.)

into an inner and outer section. This baffle slopes slightly outward, so that during the "spin cycle," centrifugal force causes liquid in the inner section to spill over into the outer chamber. When the agitator slows down and stops for the rinse cycle, the liquid runs out into the wash water through the five dispensing slots in the bottom of the device.



**How it works:** water conditioner is poured into dispenser (top left); during spin phase, it is centrifugally spilled from inner to outer chamber and held there (top right) till agitator stops prior to rinse phase; it then discharges through molded-in slots into water (right)

**Molded in two sections**

To obtain the required design features and facilitate production, the Norge dispenser is molded in two sections which are cemented together. Of these, the more intricate is the base section, which incorporates the internal baffle, the dispensing slots, the filling receptacle, and, on its bottom surface, the cup-like cavity which fits down over the top of the agitator spindle. The top section is, in effect, a protective rim which prevents spillage of the water conditioner during the spin cycle and also makes it impossible for the housewife to pour the solution into the wrong section of the wheel. The two parts are molded with mating tongue and groove edges for permanent and leak-proof assembly.

The Norge dispenser wheel was one of the first commercial products molded of a new styrene formulation—Dow Styron 440. The material selected had to be sufficiently tough to resist shattering in case the unit should be accidentally dropped by the housewife; it also had to stand up under heat and humidity conditions, resist laundry chemicals and water absorption, and present a pleasing appearance. Integral color—in this case, a pastel green—and immunity to corrosion were among the other basic necessities. This material, (*To page* 196)

*Portable, inflatable radar antenna involves vinyl-coated glass fabric and metallized polyester film*

# The Paraballoon

**Vinyl-coated** fibrous glass fabric portion of radar antenna is assembled with specially designed equipment. First, gores are heat-sealed together with T-seams to give a slightly undersize antenna. Using a checking fixture and hand-working the seams, antenna is then brought to exact parabolic contour. After contouring is complete, seams are permanently taped to fix their position

A lightweight, mobile radar set of revolutionary design and long range has been developed by Westinghouse Electric Corp. for the U. S. Air Force, using vinyl-coated fibrous glass fabric and metallized Mylar polyester film.

Key to the development is the radar antenna. This consists of two paraboloids formed of the vinyl-glass fabric, which are joined at their rims and inflated for use. On the interior of one of the paraboloids is the radar reflector which consists of the metallized film. The double paraboloid is called the Paraballoon antenna of the radar set, which was developed to detect high-flying aircraft.

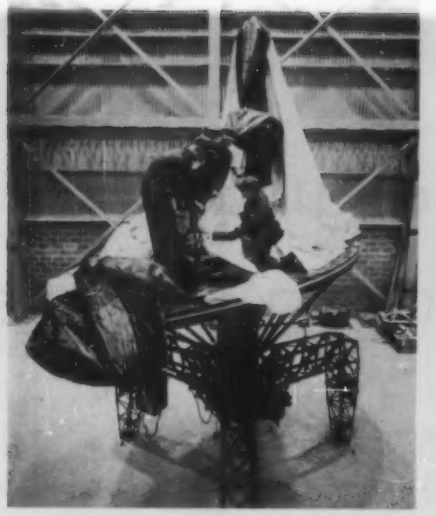
An air-supported radome—lightweight, sectionalized, and designed to be erected directly on the ground—protects the radar and electronic equipment, operating personnel, and the Paraballoon antenna from high winds and ice loads. Within the radome, made of neoprene-coated nylon fabric, the Paraballoon antenna is supported in an upright position on a collapsible magnesium base by a difference in air pressure. Thus, a compact and complete radar structural system is obtained which is literally "blown up like a balloon."

The radome can be deflated and unzipped into sections and the associated supporting structures collapsed. The entire antenna system can be dismantled in a matter of minutes and packed in small shipping containers.

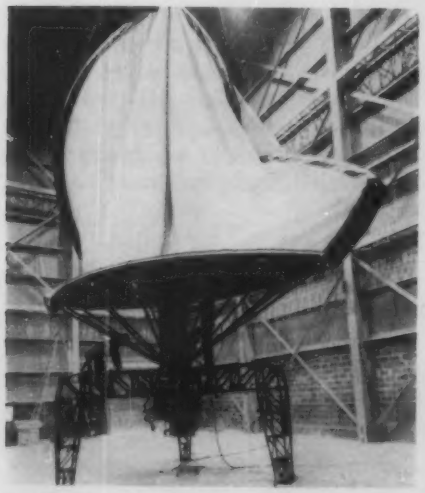
The vinyl-coated fibrous glass fabric used in the Paraballoon antenna was chosen because of its high modulus of elasticity and consequent low stretch, and because the particular vinyl coating selected is transparent to radio frequencies. When inflated, the two paraboloids are stabilized by a 16-in.-diameter neoprene-nylon tube that is incorporated in the rim of the Paraballoon and inflated to 10 p.s.i.g.; pressure within the Paraballoon is less than 0.02 p.s.i.g.

First Paraballoons made were 30-ft. high, with an 18- by 5-ft. metallized Mylar reflector applied to the paraboloid by a pressure-sensitive cement. Later models are 50-ft. high with

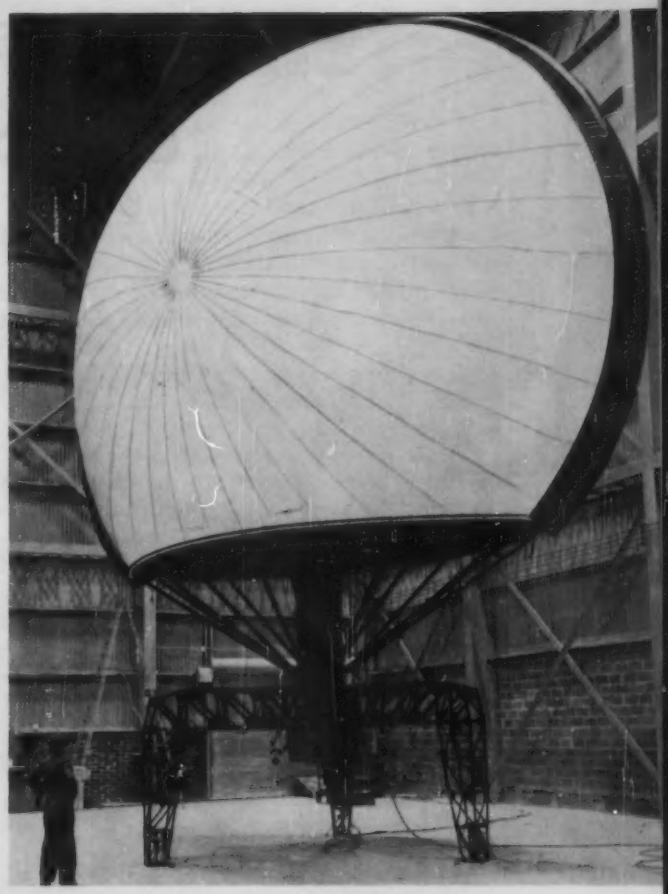
**Paraballoon** includes metallized Mylar reflectors bonded to vinyl-glass fabric



**Steps in inflating** Paraballoon: First, 30-ft. paraboloids are zipped to 16-in.-dia. neoprene-nylon tube which is attached to narrow ends of antenna base and forms stiff and stable arch which is main structural member of inflated balloon. (Photos, Westinghouse Electric Corp.)

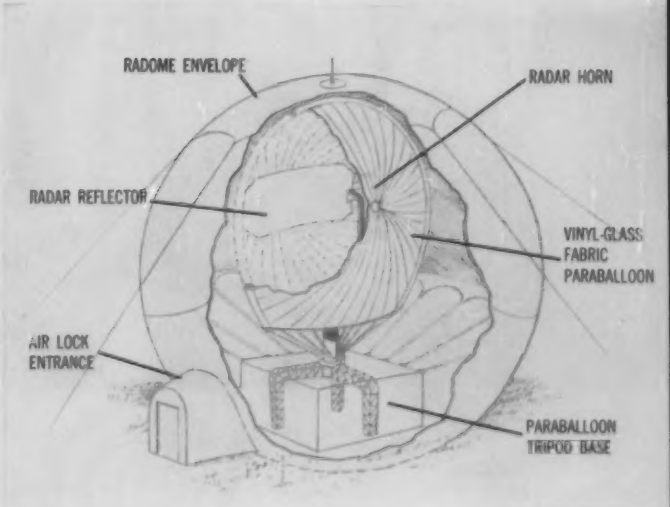


**Next,** the antenna inflation blower and tube compressor are started to begin the inflation operation



**Fully inflated** antenna. When disassembled, this 30-ft.-high unit, including its radome housing and associated electronic equipment, can be transported by four standard military 2½-ton trucks and erected and made operable by its crew in less than two hours

**Cross-sectional** view of a complete Paraballoon-type radar antenna installation




a 30- by 20-ft. reflector prebonded to the vinyl-glass fabric before the antenna gore sections are cut.

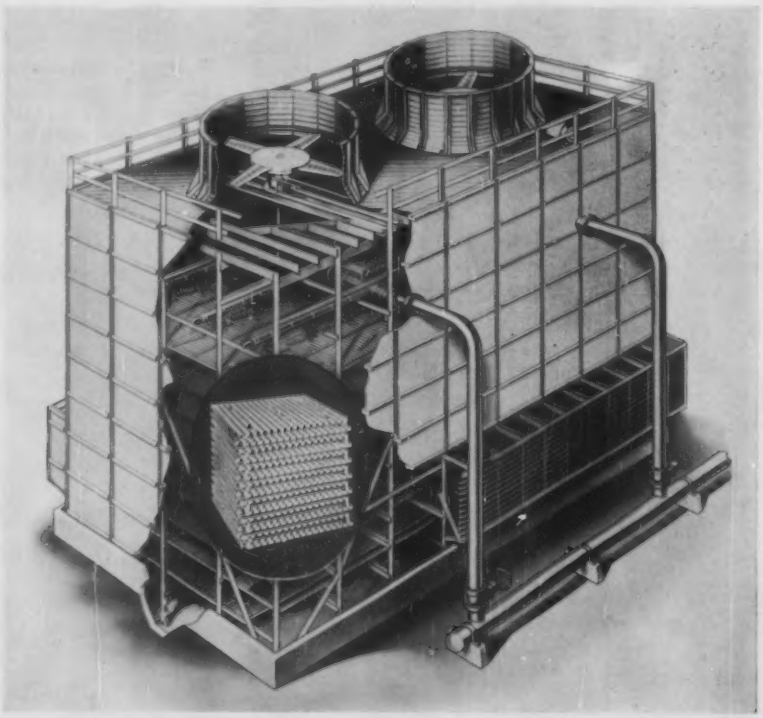
According to Major General Stuart P. Wright, Commander, Rome Air Development Center, Griffis Air Force Base, N.Y., "this outstanding development is a major break-through in the design of ground electronics equipment. The air-inflated Paraballoon antenna is the key to a large and truly mobile radar set. It is now possible to employ high-power radars in tactical situations and locations where time and transportability are of utmost importance."

# Molded grid for cooling towers

*Injection molded styrene or high-density polyethylene parts weighing 4 lb. each are going into a rapidly expanding market*

A vital new market for thermoplastics is indicated by the recent introduction of Poly-Grid, a new plastic "packing" for water cooling towers designed, fabricated, and erected by Fluor Products Co. Jointly developed by Fluor research and development engineers at Whittier, Calif., and the Plastics Div. of General American Transportation Corp., the new grids are now in production at the GATX plant in East Chicago, Ind.

Construction of water cooling towers is big business. At least $20 to $30 million are spent on new installations each year, and Fluor Products Co., a Div. of The Fluor Corp., Ltd., a major industrial construction company, accounts for a third to a half of this total. Most of the dollar volume comes from industrial installations, ranging up to huge, multiple-tower units costing a million dollars or more. There is a growing market, however, for the smaller towers used in air conditioning systems for office buildings or apartment houses. The daily



**Cut-away** view of typical large industrial cooling tower, revealing grid packings on the inside. Shown enlarged in inset is a deck of molded polyethylene grids. A single large tower may require as many as 50,000 individual moldings weighing 4 lb. each. (Illustration, Fluor Products)

U. S. commercial consumption of water is established at over 100 billion gal., and at least a third of this volume is known to go for cooling.

For all industrial and air conditioning applications Poly-Grid can now take the place of wooden bars or slats used to break the water into droplets or films as it cascades down through a cooling tower. During this breaking up process part of the water is evaporated by air flowing upwards, and this cools the balance of the water.

Poly-Grid packing is made up of single-shot, 4-lb. moldings of polystyrene or high-density polyethylene, 8 and 9 sq. ft. in area.

A fairly good idea of the potential market for thermoplastic materials can be realized from the simple fact that one single large industrial tower may require as many as 50,000 individual moldings.

**Falling film of water**

Packings now used for cooling towers may be classified as either splash or film type. In the splash type, wooden grid bars are joined together to form decks, the thicknesses of the grid bars varying among cooling tower manufacturers from ⅜ to 1 in. and the spacing of the decks from 1 to 2 feet. Most of the evaporation takes place when the water, in the form of droplets, is falling from one deck to the next.

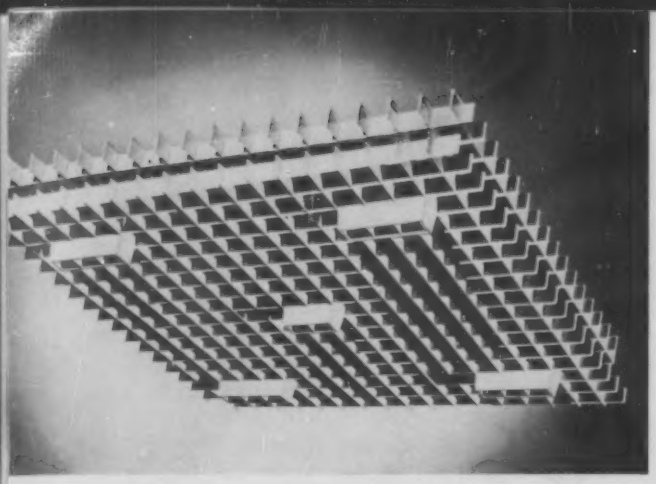
In film-type packing, the water flows in a relatively continuous film over wetted surfaces so that the surface available for heat and mass transfer is closely related to the surface area of the packing material. This type of packing is constructed of wood slats with alternate layers crossed so that when viewed from the top, numerous square openings are seen as in an egg crate.

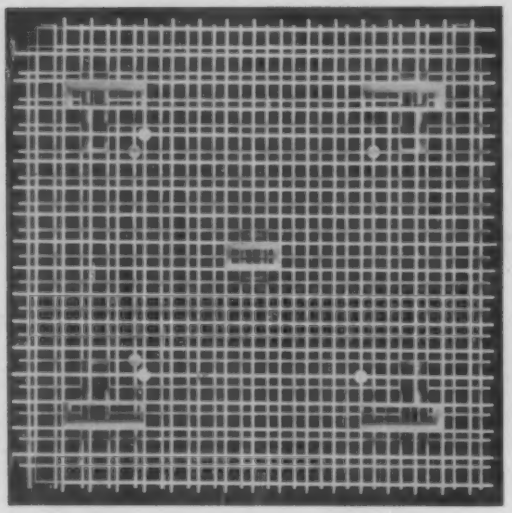
Both the splash and film type packings have certain limitations. If the slats are thick enough to provide a sturdy, long-lasting structure, there is not enough space between them for easy flow of air. On the other hand, if thinner slats are used, the cost of maintenance and repair increases, even though the wood is treated with a preservative for protection against fungi.

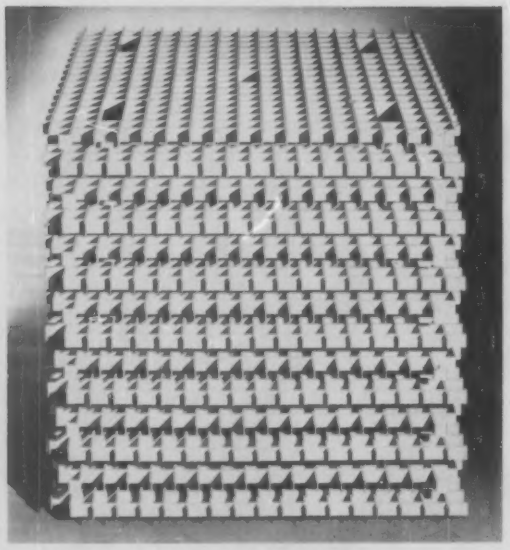
The reason is that the treatments now in use do not limit the occurrence of chemical deterioration and the wood components of the surfaces are continually broken down and washed away.

This slow process is a serious problem in

**Molded polyethylene** packing, 36 in. square with ribs spaced 1 in. apart, being ejected from mold (left) and removed from machine (below). Part is produced on a 300-oz. injection machine. Highly polished mold can be seen at right in photo below. (Photos, General American Transportation Corp.)







**Three views** of grids: top photo shows spacing supports; center photo reveals pattern of contact cells; in bottom photo is an over-all view depicting typical stacking arrangement. (Photos, Fluor Products Co.)

the case of the thin "egg crate" type of film packing, but is of little consequence in the case of thick grid bars.

**The answer in plastic**

Essentially, the objective of the Fluor researchers was to develop a design using a material that does not suffer from the limitations of thin wood slats. Competitive considerations also indicated that the substitute material must justify any increase in cost by a sharp increase in cooling efficiency.

During the course of the investigation, a great number of materials were tried, including cement-asbestos sheets, metal and plastic screens, plastics impregnated paper, ceramics, and a variety of thermoplastic resins—molded, extruded, and fabricated into a number of structural shapes.

One of the early experiments involved bundles of extruded tubes, mounted vertically in the tower. There was a problem, however, in distributing the water evenly (*To page* 198)

**Packing** safely sustains 150 lb. between spacing supports; supports themselves can carry loads in excess of 250 pounds

**Polyethylene tube,** used as protective covering in weatherproof outdoor storage, is 40 ft. in circumference and 18 ft. long, folds so compactly that it can be carried under one arm. Eight feet of film are used up in tying tube at top. (Photos, Gering Products)

**Cover** is pulled down over a full truckload (24,000 lb.) of bags of molding powder on skids. The film is compounded with carbon black for improved weatherability

# Industrial slip-covers

*Tubes of polyethylene film, 40 ft. in circumference, protect material and equipment in outdoor storage*

Gargantuan polyethylene tubes are now being offered as a new and low-cost solution to the problem of outdoor storage of materials, equipment, etc. The tubes, measuring 40 ft. in circumference and big enough to protect a whole truckload of material, are supplied by Gering Products, Inc., Kenilworth, N.J., under the name Polycov'r. The covering is estimated to cost ⅛ to ¼ that of the simplest alternate types of shelter and will retain its flexibility over the wide temperature ranges in different parts of the country. Though designed for temporary storage, the tubes are re-usable with normal handling.

Produced by the blown film extrusion process, the 6-mil polyethylene film is compounded with carbon black for weather resistance. The giant sleeve is made up of two tubes 20 ft. in circumference which are slit and joined. Gering Products ships Polycov'r in 100-ft. rolls which can be cut to desired lengths by yard crews for a variety of storage jobs. On special order, the film can be had in precut lengths.

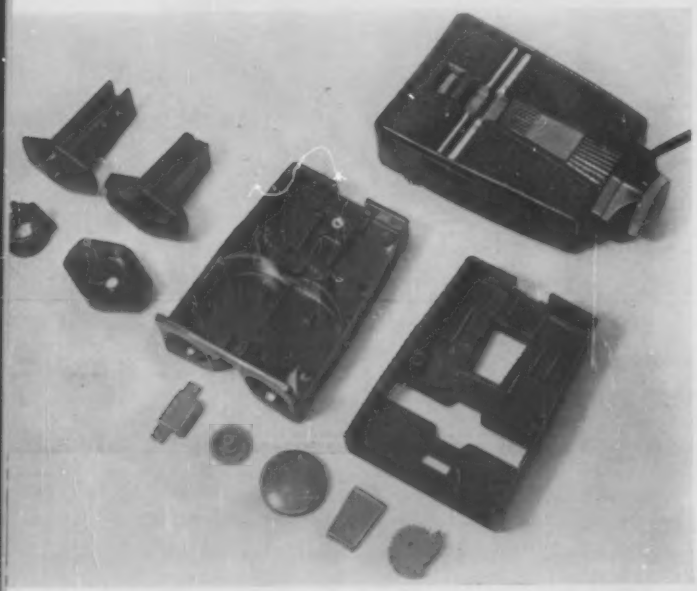
Use of the cover is very simple. The tube is cut to length, pulled down over the load of material, and tied at the top. It can also be secured at the base if desired. The light weight makes handling easy, and the flexibility of the film permits folding to a small package. The "tent" illustrated was formed from an 18-ft. length of film weighing about 20 pounds. Cost of the covering was about $25.

# Precision parts for

*Dimensional stability, heat and impact resistance, light weight, and low cost were all factors in selection of plastics materials*

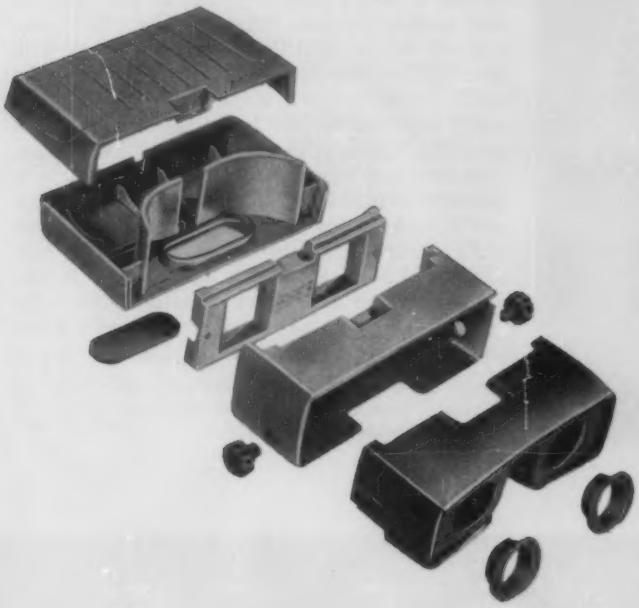
Improvements in performance and operation being offered to the consumer by two newly redesigned all-plastics slide viewers point up the reasons why this application has remained over the years a standard volume market for plastics materials of all types. Far from being static, the industry has taken advantage of the design potential inherent in plastics and have come up time and again with improved variations on the basic design. (See also "Styrene parts in stereo viewers," MODERN PLASTICS *28*, 89, July 1951).

The two new models are no exception. One, the Realist Stereo Viewer marketed by David White Instrument Co., Milwaukee, Wis., is engineered so that it can be operated either from a light socket or battery. A flick of the release button is all that is necessary to change



**Eleven plastics parts** (above) make up new stereo viewer (right). Housing, lamp attachments, and lens mount (center row, above) are molded of phenolic, knobs and trim (bottom row, above) of styrene. (Photos, Chicago Molded Products)

# stereo viewers



**Styrene copolymer** materials are used in the precision molding of the ten component parts (left) of another model stereo viewer (above). Parts include battery housing halves, lens mount, adjusting front, eye pieces, and adjustment knobs. (Photos, General Electric Co.)

from one to the other. Similarly the Stereo Graphic Viewer being marketed by Graflex, Inc., Rochester, N. Y., has been designed so that the user has a choice of viewing slides by natural or artificial light. Improved focusing adjustments are features of both models.

**Precision molding essential**

In both instances, improvements in the new models were made possible largely by the perfection of techniques for precision molding the complex plastics components to close tolerances. The Realist Stereo Viewer, which is molded by Chicago Molded Products Corp., Chicago, Ill., is made up of 11 plastics parts—six transfer molded black phenolic pieces, including the case halves, lamp attachment, and lens mount, and five injection molded pastel green high-impact styrene pieces, used to give an attractive color contrast to the black phenolic housing. Three transfer molds (a two-cavity mold, a four-cavity mold, and a six-cavity mold) are used for the phenolic parts and one six-cavity mold is used for the styrene parts. A pebble-grain finish is molded into the outside of the phenolic case; that part of the mold which forms the inside of the case is sand-blasted to produce a molded surface with minimum light reflection.

The Stereo Graphic Viewer, which is molded by General Electric Co., Taunton, Mass., is made up of ten separate pieces, including the case, battery housing halves, lens mount, eye pieces, and adjustment knobs, all precision molded of styrene copolymer materials. Eight molds run on a battery of injection molding machines, ranging from a 3-oz. to an 8-oz., are used for turning out the various pieces. On the smaller parts, such as the adjustment knobs, submarine gating is used to minimize gate removal problems.

As the photographs on these two pages show, wherever possible, the construction of the molded piece is such that the pieces interlock or nest together. Thus, assembly is facilitated and costs lowered. Other reasons for selecting plastics for the application: light weight (the Stereo Graphic Viewer, complete with batteries, weighs only 16 oz.), resistance to heat (bulbs are used inside both housings), durability, integral coloring, and resistance to body acids and sunlight.

## Lawn sprinkler

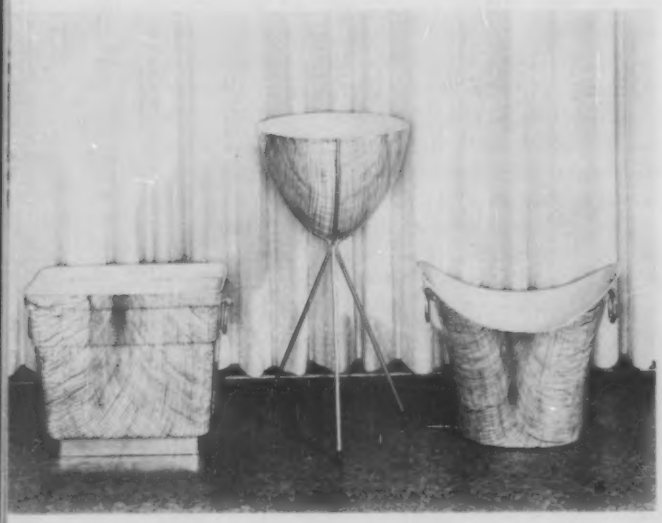
There are no moving parts to wear or get out of order in the latest lawn and garden sprinkler to be offered with a stationary head molded of cellulose acetate butyrate. The shape of the water channel molded into the sprinkler head is such that the incoming water is diverted and broken up into a fine spray which, at the water pressure normally available in the home, gives a thorough sprinkling coverage of approximately 400 sq. feet.

Molded into the head of Spikie, as the new sprinkler is called, is a threaded hole into which can be screwed any standard hose fitting. A metal spike firmly affixed in another molded-in hole provides a means of setting the sprinkler in any desired position in the lawn or garden. The tough butyrate will take any amount of normal abuse and will not rust or corrode.

*Credits:* Manufactured by Wilson Plastics, Inc., Sandusky, Ohio. Cellulose acetate butyrate from Eastman Chemical Prods., Inc.

# PLASTICS

## Versatile reinforced plastics planters



Increased attractiveness is given to a line of reinforced plastics planters by the introduction of a veil mesh bonded permanently in the polyester-glass surfaces. Practical as well as beautiful, these planters are being suggested for a variety of uses ranging from waste baskets and beverage coolers, to their nominal use for holding plants.

The planters are produced in matched metal molds on a 20-ton press. Before molding, the general shape of the finished product is produced by a standard preform process which involves chopped fibrous glass roving and polyester resin. Production of the veil mesh pattern is accomplished in an intermediate step between preforming and molding, in which careful gathering of an overlay mesh is the key to the resulting symmetrical pattern.

*Credits:* Molding by Kimball Mfg. Corp., San Rafael, Calif. Glass from Owens-Corning Fiberglas Corp. Polyester resin from Bakelite Co.

## Balloon valve

Utter simplicity characterizes a two-piece molded polyethylene valve designed for use with ordinary toy rubber balloons and equally applicable in other areas where quick and easy air inflation and deflation are desired. The valve consists of two pieces: a cylinder and a plunger. Air pressure in the balloon keeps the valve closed, in which position the outer end of the plunger is exposed. Finger pressure opens the value to deflate the balloon.

Use of this valve increases the play value and life of toy balloons because it eliminates the need for tying knots in the balloon necks or closing them with string. The valve is sold installed in a balloon but can be re-used when the original balloon bursts, simply by slipping it into the mouth of another balloon.

*Credits:* Valve parts injection molded by T-Tool and Die Co., Los Angeles, Calif., of Spencer Chemical Co.'s Poly-Eth. Valves marketed by Eagle Rubber Co., Ashland, Ohio.

# PRODUCTS

## Carry-all bag and inflatable pillow

A new combination carry-all bag and air pillow for use at the beach or pool or on picnics holds lunch, swim suits, sun glasses, etc., for two people, or it can be easily inflated for use as a comfortable head-rest. Made of a vinyl film laminate, the new bag is durable yet light in weight, soft, and flexible. The film used is resistant to damage by salt water, most chemicals, strong sunlight, mildew, or fungi. Spilled food and suntan lotions are easily wiped off the surface and will not leave stains. And because the film is virtually waterproof, damp towels and bathing suits can be carried in it. The carry-all is 17 in. long by 6½ in. in diameter.

The inflatable feature is made possible by the use of a double lining of vinyl film, fitted with a simple inflating tube which is slipped under the slide fastener of the bag to hold the air in; the head-rest is deflated simply by releasing the tube.

*Credits:* Made by Comar Plastics, Inc., New York, N. Y., from Bakelite's Krene film.

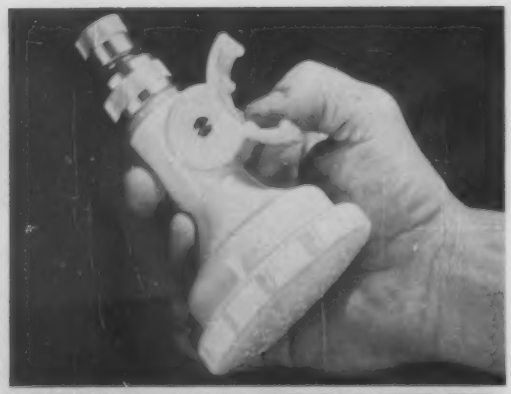
## Beach table

Fabricated of 10-gage vinyl sheeting, another aid to fun and comfort at the beach is an inflatable table which, when deflated and folded in the middle, becomes a commodious carrying bag. When used for this purpose, a snap fastener holds the folded halves together and, with its two handles, the bag can safely hold a load of 15 to 20 pounds. All seams are heat sealed.

When opened and inflated for use as a table, the useful top area is about 30 in. square and keeps food and drinks nearly a foot off the ground. Seven wooden dowels attached to the under side of the table top eliminate sagging and act as reinforcements to make the table rigid. When the table is turned over, the four inflated sides of the table serve as a comfortable four-way head-rest.

*Credits:* Port-a-Table manufactured by Aquador Plastics, Inc., Brooklyn, N. Y. from Bakelite's Krene sheeting.

# PLASTICS



## Shower head

Designed for "a lifetime of bathing pleasure," a new shower head with a built-in valve has a number of molded nylon parts and an orifice disk of Mylar polyester film. The plastics were selected for their toughness, plus the fact that they resist chemical attack and the adherence of lime.

The parts of the Perma-Jet shower head are so arranged that the incoming water stream is divided into a uniform spray pattern without a hollow cone, side jets, or mist. These parts include a nylon face plate, the polyester film disk which regulates the size of the individual jets, and a nylon screen attached to the main nylon housing.

The crescent-shaped fitting on the top of the main housing is the handle of the regulator valve which controls the force of the spray from "hard" to "soft" or can be used as a positive shut-off to eliminate the annoyance of a dripping fixture.

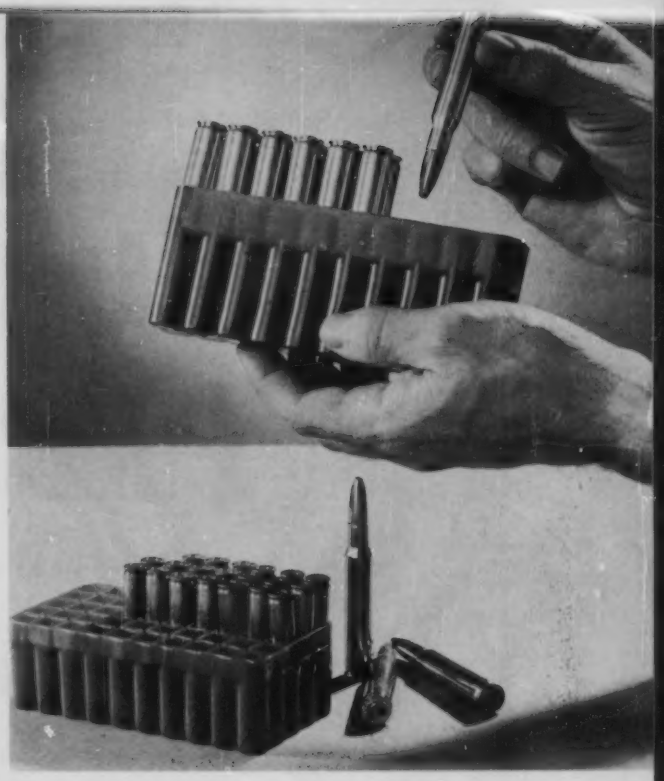
*Credits:* Manufactured by Webb Industries, Bay Village, Ohio. Zytel nylon from Du Pont.

## Ammunition box

Many of the ammunition problems of the hunter, match shooter, and handloader are solved by a series of injection molded polyethylene cartridge boxes recently placed on the market. Basically, the boxes are hollow molded blocks of polyethylene, with accurately sized sleeves, produced during the molding operation, to hold the cartridges in position.

These boxes make it possible for shooters to keep their ammunition clean and dry as well as ready at hand when needed. The resiliency of the material provides a desirable degree of shock absorbency and its toughness assures years of service. When using these boxes, the shooter will no longer be plagued with the nuisance of torn cartridge containers and collapsed partitions.

*Credits:* Molded by Crescent Mold Engineering Corp., N. Hollywood, Calif., for Fitz, Los Angeles, Calif., using Eastman Chemical Products' polyethylene.



# PRODUCTS

## 'Straw' baskets molded of polyethylene

Simulating handsome Italian and Portuguese hand work in straw, colorful openwork baskets molded of polyethylene in one piece add colorful touches to the home or office. The lattice-work baskets are soft and flexible, and their smooth molded surfaces will not scratch finely finished furniture.

In the left-hand photograph is shown a type of basket which is useful for serving rolls and bread, fruit, candy, and fried foods such as chicken-in-the-basket. This basket is available in a variety of colors, including copper, gold, and a variety of pastel shades. The molded plastic material is non-toxic, resists food and grease stains, and is easily cleaned with soap and warm water.

In the right-hand photograph is a scrap basket which would be equally at home in the boudoir, bathroom, living room, or office. It is offered in copper, gold, white, silver, and pink.

*Credits:* Produced by Jaydon, Inc., New York, N. Y., from Bakelite's polyethylene.

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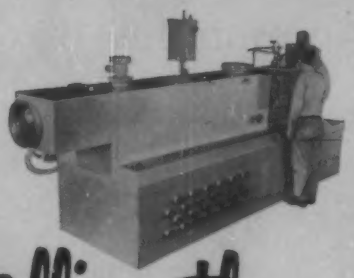

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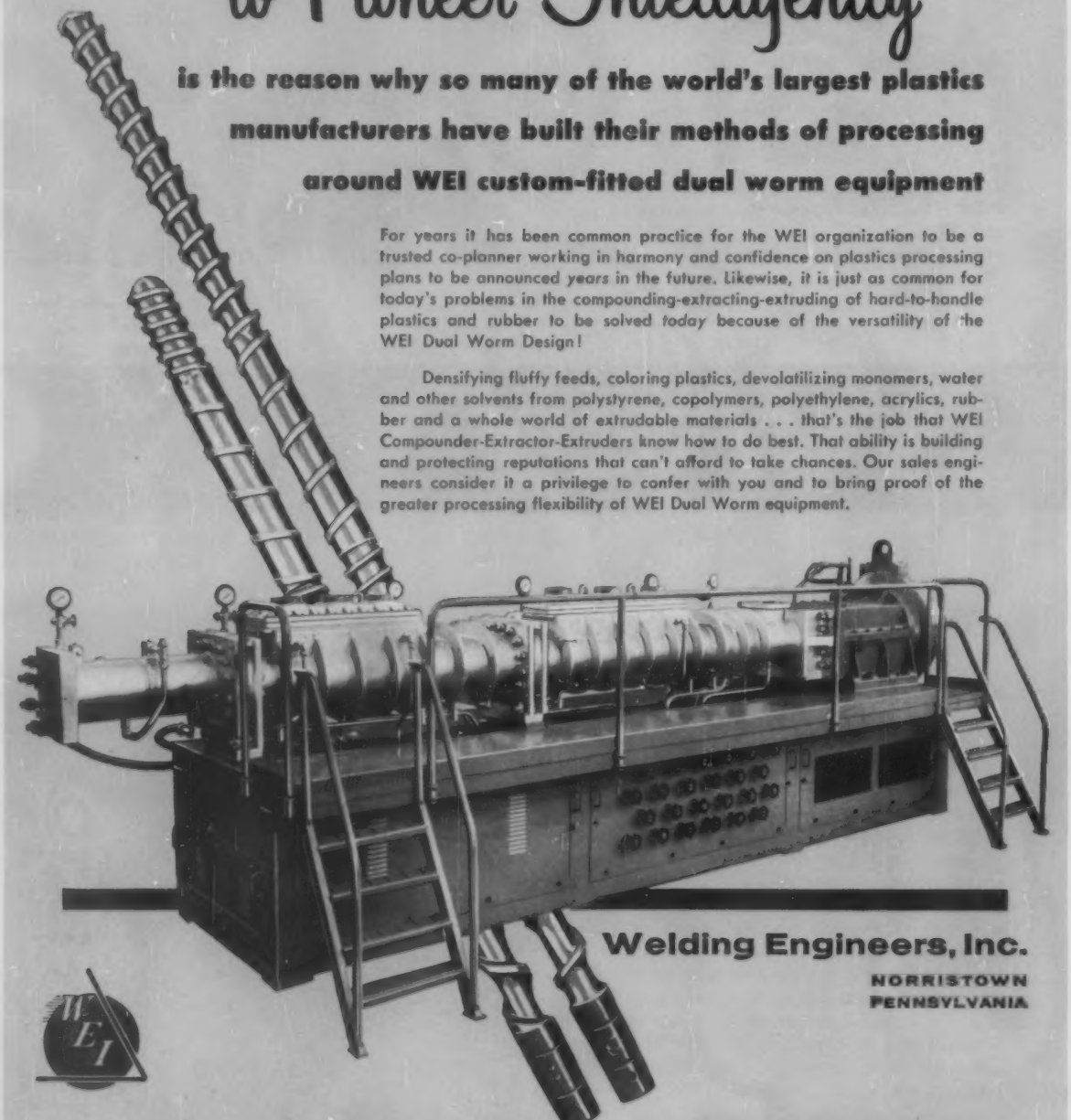

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Plastics Engineering

Dr. James F. Carley, Engineering Editor

# Spiral-flow molding *compares the flow behavior of thermoplastic materials under actual injection molding conditions*

*By L. Griffiths*†

In developing new and improved materials for injection molding, it is necessary to evaluate both the performance of materials during molding and their performance as moldings in service. Whereas the latter can be predicted within reasonable limits from physical constants established by recognized tests, assessment of "moldability" is, as yet, an entirely different matter. Ultimately, judgment is made by the molding industry as a result of production experience and it is unlikely that there will ever be a complete substitute for this. Nevertheless, initial sorting tests on a quantitative basis are essential requirements of a materials manufacturer and new ideas on this subject are always of interest.

By the very nature of injection molding, there cannot be a simple yardstick of moldability and assessment of this quality must embrace various factors. Of these, the molding temperature range of a material and its flow performance over this range would appear to be of first importance, provided such assessment is made under actual molding conditions. This stipulation rules out the use of laboratory-type flow tests because of the great difficulty of relating their results to conditions encountered in molding practice. Assessment must be made using an injection machine under conditions as near normal molding practice as can be contrived. One approach is to use a mold which is difficult but not impossible to fill, and to determine, over a range of cylinder temperatures, the minimum injection pressures required to produce full moldings (see Ref. 1). However, an inherent difficulty of this technique is that of judging a "full" molding on which the minimum pressure conditions are based.

In our laboratories it was felt that measurement of flow lengths under controlled conditions of temperature and pressure would yield more information and would eliminate the difficulty mentioned. A technique for doing this was developed and, after some years of successful operation, it was reported at the 1955 British Plastics Convention (Ref. 2). Since then, further results of more general interest have emerged.

### Spiral mold

Briefly, the idea was to dispense with the use of a normal mold cavity and instead, to provide a mold with a long calibrated channel in which flow lengths could be measured. A convenient form of such a channel was an Archimedean spiral with radius increasing half an inch per revolution, the section being a half round

**Fig. 1:** One-half of mold used in spiral-flow tests and a 32-in. polyethylene spiral molded in it. (Illustrations, Imperial Chemical Industries Ltd.)

*Reg. U.S. Pat. Off.

†Technical Service & Dev. Dept., Imperial Chemical Industries Ltd., Plastics Div.

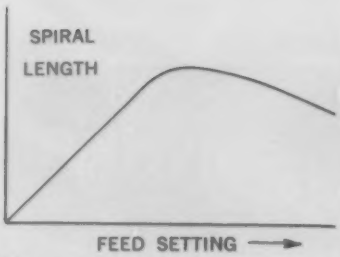



**Fig. 2:** Typical form of variation in flow with feed setting on molding machine. Temperature and pressure are fixed

3/16-in. in diameter (see Fig. 1, p. 111). This gives a channel length of 77 in. in a mold whose over-all dimensions are only 12 by 9 inches. Means of controlling mold temperature are provided.[1]

When a mold of this type was first used on a small injection machine, various problems arose before we were able to achieve our aim of measuring flow lengths under prescribed conditions of temperature and pressure. The most obvious difficulty was with regard to the feed setting. Whereas in normal injection molding practice, the feed is set to give sufficient material to fill the mold cavity under the conditions of temperature and pressure used, with this mold there is no fixed setting, since the object is not to fill the mold but to measure the extent of flow achieved. Further problems were to control and measure the temperature of the material in the cylinder, and to establish a suitable time cycle.

### Feed setting

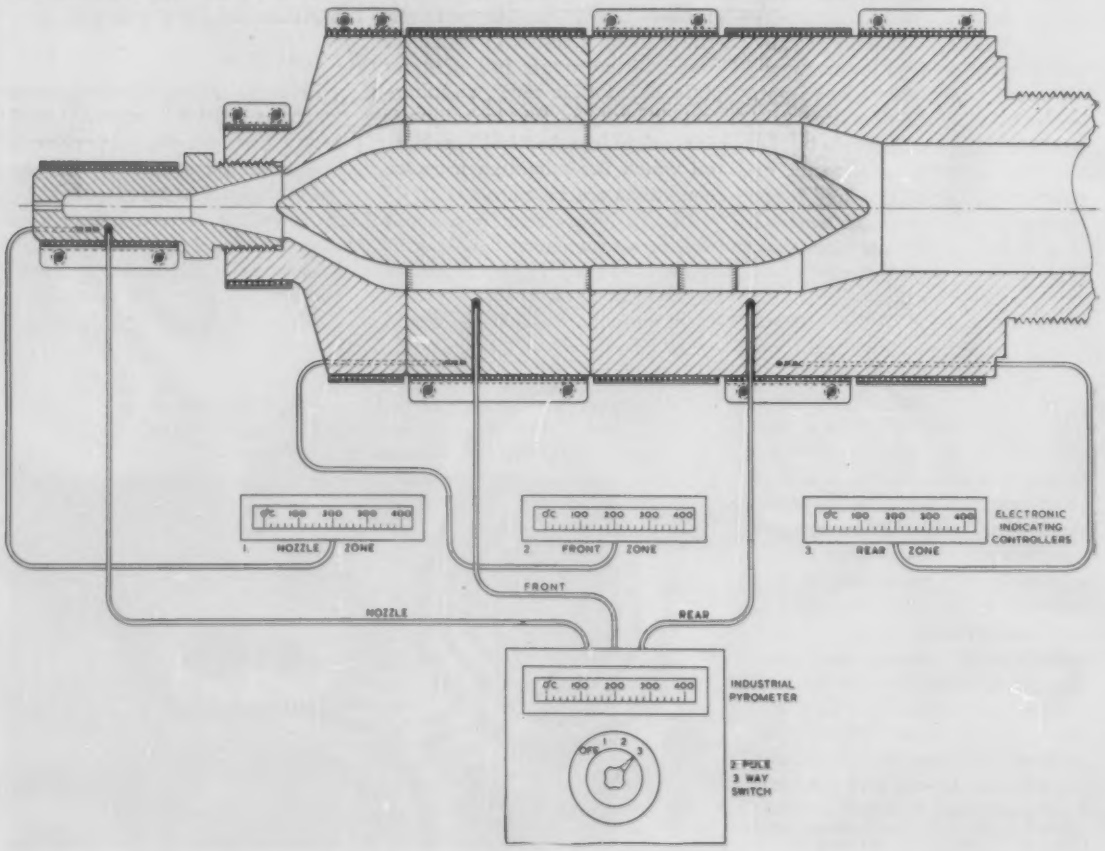
Using fixed values of cylinder temperature, mold temperature, and applied pressure, it was found that the relation between feed setting and molded spiral length was always of the form shown in Fig. 2, left. It is seen that starting from zero setting, spiral lengths increase progressively with feed until a maximum is reached, after which they fall slowly. This optimum feed setting is always found experimentally for each set of conditions by starting with a small feed and increasing it step by step until the plunger just fails to complete its full forward stroke, indicating that flow into the mold has ceased. If the feed is then held constant, succeeding shots give spirals of about the same length provided all other conditions remain unchanged. The procedure adopted is to allow equilibrium conditions to be established and then to take the average length of 10 successive spirals as the flow value for that particular set of conditions.

### Temperature control

To achieve spirals of uniform length, the material entering the mold must be heated to a uniform

[1] *Ed. note:* A somewhat similar technique is described briefly in "Mold temperature effects in polyethylene molding," by C. S. Imig, MODERN PLASTICS 34, 149 (Dec. 1956).

**Fig. 3:** Diagram of injection cylinder and nozzle, showing locations of controlling and monitoring thermocouples. This system eliminates cycling of melt temperatures common in usual systems



**ALKATHENE 2**

at ram pressure of 20,000 p.s.i.

| Test A | 140° C. | 180° C. | 220° C. | 260° C. |
|---|---|---|---|---|
| | 14⅛ in. | 18⅛ in. | 21¾ in. | 25 in. |
| | 14 | 18¼ | 21¾ | 24⅞ |
| | 14 | 18¼ | 21⅞ | 24⅞ |
| | 14 | 18¼ | 21¾ | 24¾ |
| | 14 | 18⅜ | 21⅞ | 24¾ |
| | 14 | 18⅜ | 21¾ | 24⅞ |
| | 14⅛ | 18¼ | 21⅝ | 24⅞ |
| | 14 | 18⅛ | 21¾ | 25 |
| | 14 | 18¼ | 21⅞ | 24⅞ |
| | 14⅛ | 18¼ | 21¾ | 24⅞ |
| RANGE | ⅛ | ¼ | ¼ | ¼ |
| MEAN | 14 | 18¼ | 21¾ | 24⅞ |

| Test B | 140° C. | 180° C. | 220° C. | 260° C. |
|---|---|---|---|---|
| | 14⅛ in. | 18⅜ in. | 21¾ in. | 24¾ in. |
| | 14⅛ | 18⅜ | 21⅞ | 24⅞ |
| | 14⅛ | 18¼ | 21⅞ | 24⅞ |
| | 14 | 18⅜ | 21⅞ | 25 |
| | 14 | 18½ | 21¾ | 24⅞ |
| | 14 | 18½ | 21¾ | 24¾ |
| | 14⅛ | 18⅜ | 21¾ | 24¾ |
| | 14⅛ | 18¼ | 21⅝ | 24¾ |
| | 14⅛ | 18⅜ | 21⅝ | 24¾ |
| | 14⅛ | 18⅜ | 21¾ | 24¾ |
| RANGE | ⅛ | ¼ | ¼ | ¼ |
| MEAN | 14⅛ | 18⅜ | 21¾ | 24¾ |

**ALKATHENE 20**

at ram pressure of 20,000 p.s.i.

| Test A | 140° C. | 180° C. | 220° C. |
|---|---|---|---|
| | 22¼ in. | 30¼ in. | 37 in. |
| | 22¼ | 30⅛ | 37 |
| | 22⅜ | 30⅛ | 37⅛ |
| | 22⅜ | 30⅛ | 37⅛ |
| | 22½ | 30¼ | 37⅛ |
| | 22⅜ | 30⅛ | 37¼ |
| | 22⅜ | 30 | 37¼ |
| | 22⅜ | 30 | 37⅜ |
| | 22½ | 30 | 37⅛ |
| | 22⅜ | 30⅛ | 37⅛ |
| RANGE | ¼ | ¼ | ⅜ |
| MEAN | 22⅜ | 30⅛ | 37⅛ |

| Test B | 140° C. | 180° C. | 220° C. |
|---|---|---|---|
| | 22⅜ in. | 30 in. | 37¼ in. |
| | 22⅜ | 30⅛ | 37¼ |
| | 22¼ | 30 | 37⅛ |
| | 22¼ | 30 | 37⅛ |
| | 22⅜ | 30 | 37 |
| | 22½ | 29⅞ | 37⅛ |
| | 22⅜ | 29⅞ | 37¼ |
| | 22⅜ | 30 | 37⅜ |
| | 22½ | 30 | 37⅜ |
| | 22½ | 30 | 37¼ |
| RANGE | ¼ | ¼ | ⅜ |
| MEAN | 22⅜ | 30 | 37¼ |

temperature throughout and the temperature must not vary from shot to shot. Temperature uniformity depends on two main factors: 1) elimination of "hunting" within the temperature control system and 2) establishing uniform temperature throughout the material by using a low plasticating rate.

A thorough examination of cylinder heating control systems led to the conclusion that the dominant factor in eliminating temperature hunting, irrespective of type of heaters or type of control instruments, is the location of the hot junctions of control thermocouples. By positioning these in slots on the surface of the cylinder so that they are in contact with resistance band heaters, accurate temperature control of the inner surface is achieved. We measure the latter at various points by deeply recessed thermocouples connected to a separate multi-point pyrometer. Fig. 3, opposite, shows the complete temperature control system. It includes an independently heated extension nozzle controlled by the same means.

Even with the cylinder inner wall held at a constant temperature, variations in material temperature can occur if large shots are taken too rapidly from a cylinder of given size. In this test, the weights of typical spirals lie in the range of 5 to 20 g.; when these are taken from a cylinder of 2-oz. (57-g.) shot capacity at a relatively long time cycle, the difficulty is avoided. Moreover, with such a low plasticating rate, the temperature of the material closely approaches that of the inner wall, which is recorded for each flow determination.

The resulting uniformity of flow length is very good, as evidenced by the data of Table I, above. In each of these two tests, which were run on different days, the shot-to-shot variation was very small, the mean range among 10 shots being only 0.25 inch. This corresponds to a standard deviation of 0.08 inch. Clearly, the small differences in the average values obtained in each test are not significantly larger than

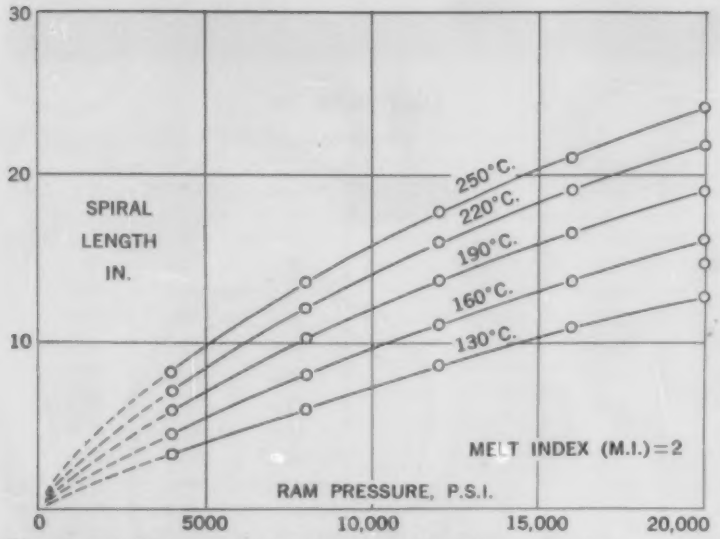



**Fig. 4:** Spiral length versus ram pressure at various temperatures for polyethylene of MI=2. In spiral mold, a five-fold increase in pressure results in three-fold increase in flow distance; rheological literature shows that in lab instruments a corresponding change in pressure can result in a 50-fold increase in rate. Disparity points up difficulty in applying lab results to injection machine conditions

the shot-to-shot differences. We could, however, reasonably expect to get different flow values on different machines.

**Time cycle**

It was considered that the time cycle should be the shortest to satisfy the following conditions:

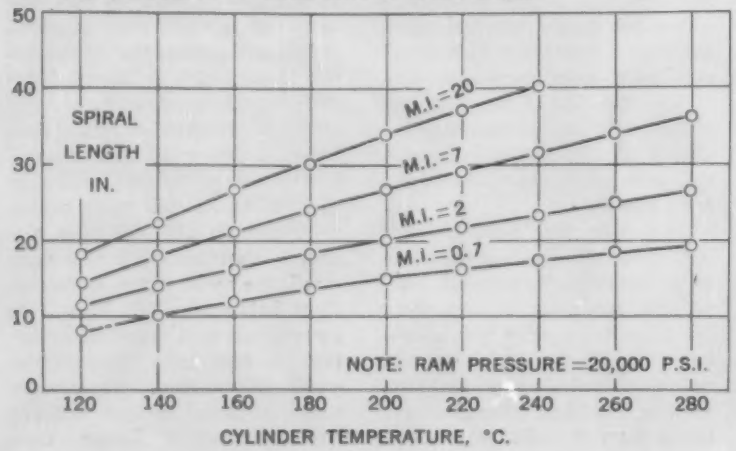
a) The injection period should be such that plunger movement ceased shortly before the full period elapses.

b) The freeze period should be sufficient for all materials to cool to a temperature at which they can be ejected without distortion or damage by ejection pins.

c) The over-all cycle should be adequate to give uniform plastication for each shot.

As a result of experience, an over-all cycle of 85 sec. was chosen, consisting of injection time (25 sec.), freeze time (50 sec.), and mold open time (10 seconds). These periods comply with all the requirements that are listed above.

**Fig. 5:** Spiral length versus cylinder temperature at ram pressure of 20,000 p.s.i. for polyethylene of various melt indexes. Here again the situation is not what would at first glance be expected from laboratory results. A 10-fold increase in melt index (itself a measure of flow) results in a two-fold increase in flow length




**Test procedure**

No special preparation of materials is necessary other than drying. Temperature controllers are set to give the required temperature at the inner surface of the cylinder and nozzle, the mold temperature is controlled at a desired value, and process timers are set at the standard times. Molding is started and the optimum feed setting is found as previously described. When equilibrium conditions are fully established, the average length of 10 consecutive spirals is taken as the flow value for the conditions used.

Such spiral length flow values can be investigated under various sets of conditions, the most useful being as follows:

a) At fixed injection pressure, time cycle, and mold temperature, measure flow over a range of cylinder temperatures.

b) At fixed cylinder temperature, time cycle, and mold temperature, measure flow over a range of injection pressures.

c) By repeating procedure *b* at a series of cylinder temperatures, a family of flow/pressure curves is obtained which characterizes the flow of an injection molding material very thoroughly.

Procedure *c* is, of course, a lengthy business and is only warranted for special investigations. Fig. 4, above, shows such a family of curves for Alkathene polyethylene of melt index 2. For general comparison purposes, procedure *a* has been found adequate; typical results for the standard grades of Alkathene are shown in Fig. 5, left.

A feature of the test is that it can be applied to all injection molding materials, enabling a "sprial-flow spectrum" chart to be compiled. Figure 6, p. 115, is such a chart in which the number of materials shown has been restricted to avoid over-complication. The cylinder temperatures used for each material range from the lowest that gives a readable flow length, to the highest that can be used without degrading the material. Exceptions are seen in the

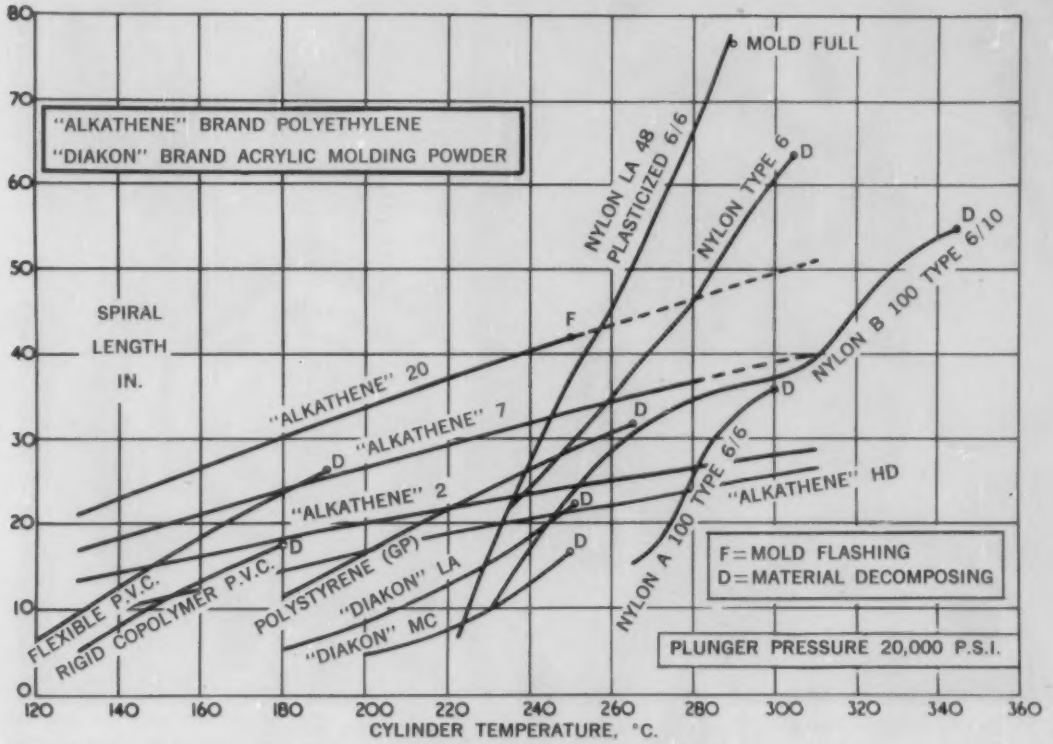



**Fig. 6:** Temperature spectrum of spiral flow for a representative group of thermoplastic molding materials. Note the wide range of slopes (temperature sensitivity of flow): from 0.19 in./°C. for Alkathene 2 to 2.1 in./°C. for plasticized nylon-6/6

case of soft-flow polyethylenes where, with the particular molding equipment used, flashing of the mold sets the upper limit of the temperature range. These curves have been extrapolated to a temperature of 300° C., which is known from experience to be a conservative rating of upper temperature limit for polyethylene under injection molding conditions.

### General discussion

When new experimental molding materials are to be evaluated, it is obviously very useful to know how their flow performance compares with those of established materials. This technique offers a convenient means of comparison using only a few pounds of material. A flow/temperature curve is plotted and, by superimposing it on the spiral-flow-spectrum chart, various comparisons can be made.

There can be no doubt that three desirable attributes for ease of molding are 1) a wide useful range of working temperature; 2) good flow values over this range; and 3) a shallow slope of the flow/temperature curve. This last feature gives molding performance in which slight changes in molding temperatures and cycle can be accommodated without serious effects on flow. All three attributes are typical of soft-flow polyethylenes, which are well known for the ease with which they can be molded.

A narrow range of temperatures, working with a steep slope of the flow/temperature curve (as shown, for example, by nylon-6/6, results in lack of accommodation and calls for the strictest control of molding conditions. The nylon family of materials is characterized by steep slope flow/temperature curves, though the 6/10 and 6 types have wider ranges of working temperature than that of type 6/6. Rigid PVC compositions and unplasticized acrylic powders have relatively stiff flow and limited temperature ranges. Both flow and working-temperature range of these are improved by copolymerization with suitable second components and/or by incorporating plasticizers.

### Conclusions

It is not suggested that the spiral-flow test by itself can assess all aspects of desirable molding performance. However, it is regarded as a fairly quick, convenient test for examining the flow behavior and molding range under molding conditions. In conjunction with other studies, the spiral-flow test gives a fairly clear impression of a material's potentiality for injection molding before it is taken to the trade for production trials.

### References

1. "A new measure of plastic moldability," by D. B. Semeyn, SPE *J. 12*, 15 (May 1956).

2. "Recent advances in injection molding and in the evaluation of molding materials," by G. Campbell and L. Griffiths, *Plastics Progress*, 1955, Iliffe & Sons Ltd., London, S. E. 1, England.

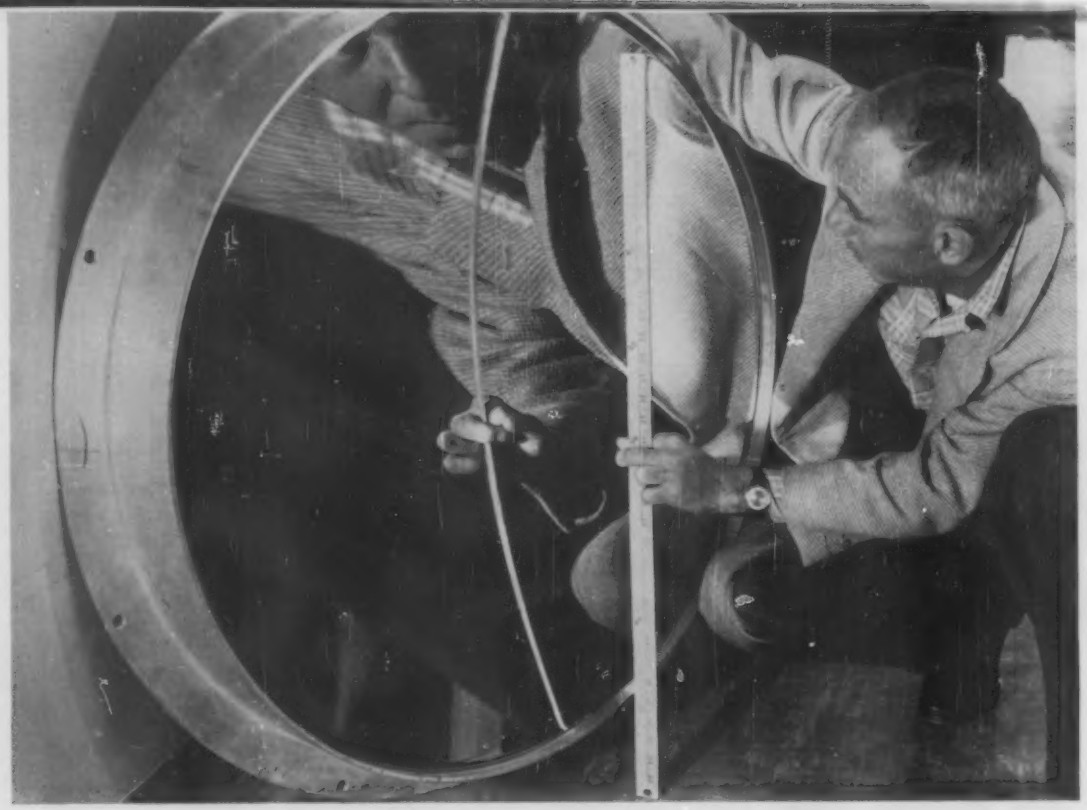


**Fig. 1:** Cast epoxy mirror of 36-in. diameter, with vacuum-metallized aluminum surface. (Since the diameter of this mirror is equal to its focal length, its aperture ratio, or "f rating," is 1.) Although there are ripples in the mirror's surface, it is usable for flash observation purposes. Subsequent mirrors were improved—but not perfect; ripples 40 millionth of an inch in height are quite apparent to the naked eye

# Epoxy parabolic mirrors

*A spinning liquid surface is parabolic;*
*epoxy resin is cured while spinning, then plated,*
*to produce inexpensive, high-grade mirrors*

*By Paul B. Archibald**

Among the most interesting surfaces of solid geometry is the paraboloid. This surface, generated by revolving a parabola about its axis, is widely used for reflectors in telescopes, searchlights, automobile headlights, and solar furnaces. The well-known characteristic of the paraboloid that accounts for its use in such devices is its ability to reflect all light approaching it parallel to its principal axis onto a common focal point, or vice versa.

The current method of forming a paraboloid surface presents certain problems requiring extensive and specialized equipment and a very large amount of labor in the final polishing operation. However, paraboloids can be made from a synthetic resin by a process that requires no extensive machinery and completely eliminates the costly and time consuming polishing operation.

### Revolving horizontal pan

The principle utilized is that a liquid in a revolving horizontal pan takes the shape of a paraboloid,[1] and that a liquid resin suitably catalyzed to harden after this form is taken will retain the shape. It is possible that this simple method was not developed sooner because no resin having all the needed characteristics was available.

With the development of the epoxy resins, which has occurred on a commercial scale only within the last several years, a satisfactory material has been made available. These resins are

*University of California Radiation Laboratory, Livermore, Calif. This work was performed under the auspices of the U. S. Atomic Energy Commission.

[1] A mathematical proof of this principle can be found in "Fluid Mechanics," 3rd ed., by R. C. Binder. 1955. New York: Prentice-Hall.

characterized by high strength, low shrinkage, and, of special interest, an extremely smooth, glass-like surface when set. This extremely smooth surface may be plated, without polishing, to produce a mirror.

The focal length is controlled by the speed of rotation of the pan. The density and the viscosity of the resin have no effect on the focal length of the paraboloid. The formula for the focal length may be simplified to $f = 17{,}710/N^2$ where f = the focal length in inches and N = the rotational speed in r.p.m. Thus a paraboloid of the general appearance of an automobile headlight is formed at 180 r.p.m. while a 36-in. focal length requires a speed of only 22.17 r.p.m. The diameter of the paraboloid, of course, is equal to that of the pan.

### Suitable resins

While various epoxy resin-catalyst systems might be employed, a suitable resin is Epon 828. Catalyzed with 5% piperidine and cured at 80 to 90° C., this resin gives satisfactory results. The principal problem has been to devise a turntable which would be free of harmful vibrations.

In 1908 and after, R. W. Wood, an American inventor, investigated the use of a revolving pan of mercury as a parabolic astronomical mirror.[2] He was handicapped by the lack of a vibration-free turntable and by variations in rotational speed. Very fortunately, insofar as vibration is concerned, the requirements for producing a mirror from a relatively viscous resin are much less severe than those for producing a smooth surface on a revolving pan of highly fluid mercury. Thus, good resin surfaces up to 10 in. in diameter were produced from a turntable connected directly to the slow-speed shaft of a gear-reduction motor. The production of 36-in. mirrors, which is currently under way, has been attended by some difficulty, the problem being aggravated somewhat by the easy success with the smaller turntables. These difficulties centered on the proper selection of bearings, reduction gears, motor, etc.

The actual production of a mirror is a relatively quick and simple process. The warmed resin and catalyst are mixed together and poured into a pan on the rotating turntable. A lid is placed over the pan to keep out dust and the resin allowed to cure for a period of from 5 to 6 hours. Additional resin may be poured onto this surface after it has set. In general, superior surfaces are obtained on the second or third pour.

**Fig. 2:** Thin paraboloid of epoxy cast on mercury rotating at 180 r.p.m. is headlight-reflector-shaped with focal length of 0.55 inch. (Photos, UCRL)

Repeated pouring also serves as a means for introducing reinforcing material into the resin without affecting the mirror surface.

### Reinforcement

Mirrors up to 36 in. in diameter with a 36-in. focal length have been produced with the techniques described. The first mirror of this size cracked after cooling. Several layers of fibrous glass cloth were placed on the surface and a new surface poured. This reinforced mirror appears to be much less subject to thermal shock. Subsequent 36-in. mirrors have been produced with a foamed-in-place plastic backing and fibrous glass reinforcement. This reduced the weight of the mirror to 25% of a solid one of the same size. These mirrors have been successfully plated with aluminum vaporized under high vacuum (see Fig. 1, opposite).

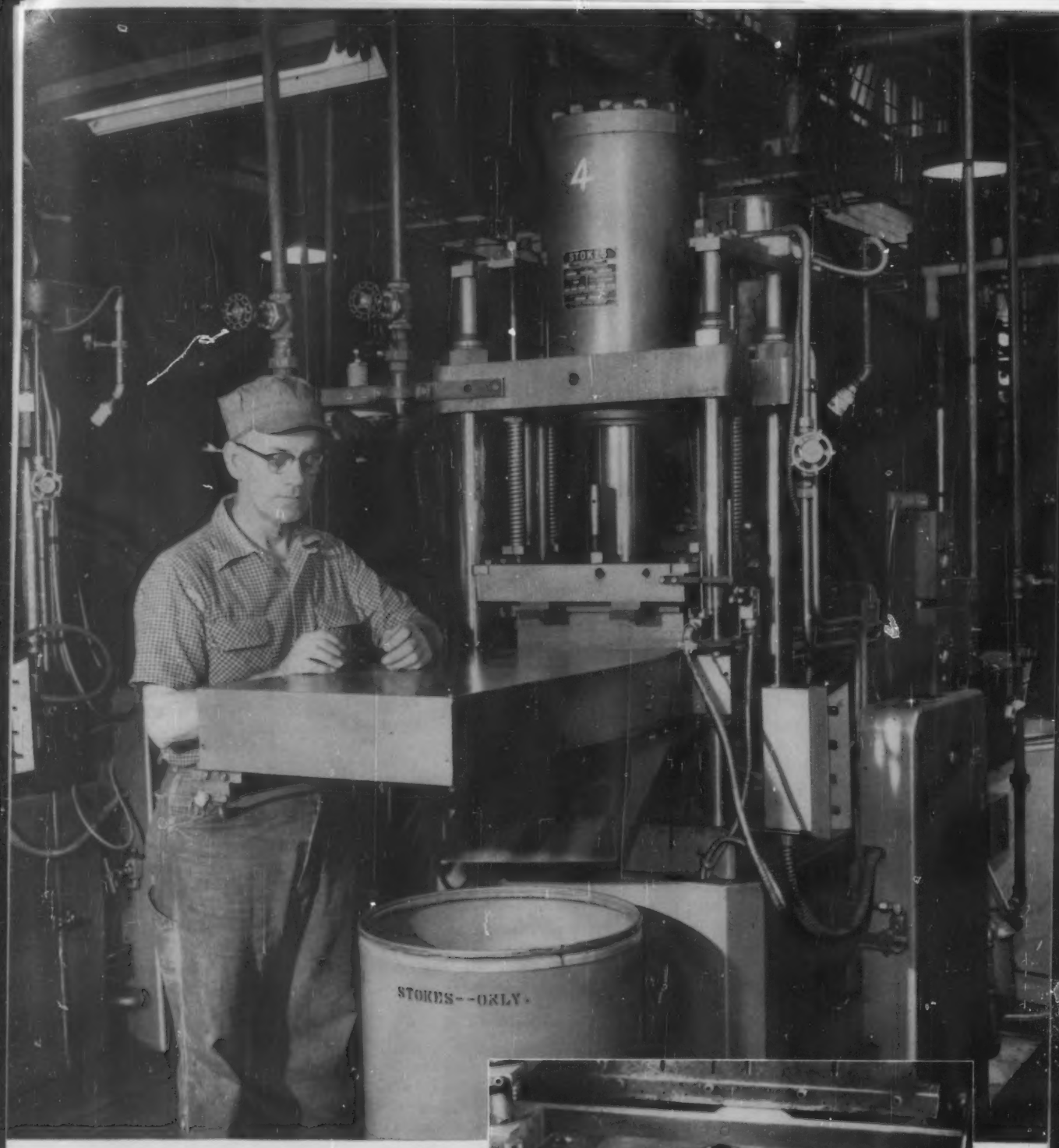
The possibility of producing a thin mirror by pouring resin onto a spinning pan of mercury was also investigated. A primary form was first cast from plastic to minimize the amount of mercury required to cover the surface. Liquid resin was then poured on the mercury and allowed to set. This produced a thin-walled paraboloid with a mirror-quality surface on both sides (see Fig. 2, left). The use of fibrous glass reinforcement with this system would appear to present no great difficulty.

Epoxy resins are characterized by a relatively low shrinkage—3 to 4% compared to 10 to 12% for the polyester resins. This small shrinkage causes negligible distortion of the paraboloidal surface. Surface tension causes a slight meniscus to form near the edges; however, the effect of surface tension on the rest of the surface appears to be negligible. In any event, mathematical analysis indicates that surface tension would tend to form a second paraboloid which would simply add to the one already present and would serve only to shorten the focal length.

### No size limit

At the present stage of development, the process described would appear to be well suited for producing mirrors of short focal length for use in solar furnaces, devices for measuring flash in nuclear explosions, etc. We have not concentrated on making mirrors of astronomical quality, but rather on making large mirrors suitable for light-gathering devices. The quality of the mirrors so far produced is better than anything now available without the use of grinding and polished techniques. However, they are not perfect, as the ripples in the surface of the mirror in Fig. 1 show. The production of astronomical-quality mirrors by this process awaits further refinements in the technique. There seems to be no size limit except that imposed by the difficulty of making large, vibration-free turntables.

[2]For details of Wood's work, see pp. 319-20 "Amateur Telescope Making," Book 1, 4th ed., by A. G. Ingalls. 1951. New York: Scientific American, Inc., and journals referred to there.




Only one operator needed to supervise all seven Stokes Model 741 50-ton automatic compression presses at American Insulator Co.

This group of parts at ejection illustrates automatic molding versatility of the Model 741 in utilizing family dies (front view).

# American Insulator Corp. maintains flexible custom molding program with versatile Stokes presses . . .

**A bank of Stokes Model 741 fully automatic compression molding presses is being used to mold a wide variety of precision electrical insulating parts at the American Insulator Corp., New Freedom, Pa.**

The company, one of the foremost custom molders of plastic products, produces parts ranging from small electrical plugs to jet tappets for steel mill use. American Insulator uses these Stokes automatic high speed molding presses for fully automatic, around-the-clock operation.

The complete flexibility and ease of adaptation and changeover of the Stokes 741's enables American Insulator to bid successfully on an infinite variety of jobs—and to meet all customer specifications.

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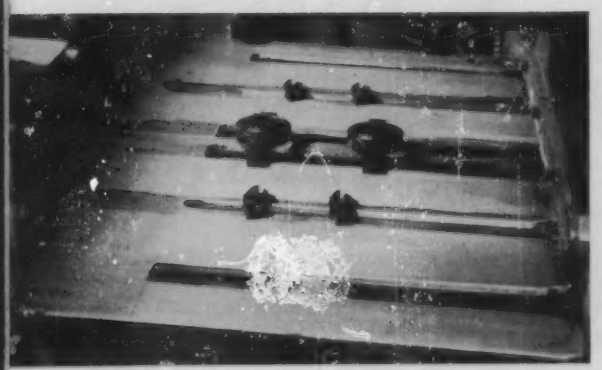
Press capacities of 50, 75, 125, and 200 tons are available. Write today for your copy of our new bulletin on the Model 741's, for a consultation on your requirements, and for a cost study on your specific application.



Positive ejection is assured by metal-to-metal seal between feed and comb.

*Plastics Equipment Division*
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**STOKES**

# Predrying of molding powders

*Conventional drying procedures are often inadequate for drying hygroscopic materials, may even make them wetter*

*By F. I. McCosh**

Users of molding and extrusion compounds know well that some materials require drying before they can be successfully molded or extruded.

Because in extrusion the pressure is released before the melt has solidified, any moisture trapped in the original powder can expand to form bubbles. The finished extrudate will then be marred by distortion, voids, and roughness.

The problem is less severe in injection molding because pressure is maintained on the molding until it has frozen. If the freezing point of the material is higher than the boiling point of water, as it is for most thermoplastics, the trapped water vapor may still expand in the frozen but warm plastic to form voids. Excessive moisture may also cause frothing at the nozzle while the mold is open, resulting in splayed pieces.

The cellulosics, nylons, and acrylics may absorb moisture from the shop air. While nylon compounds are packaged in sealed tins to prevent water pickup during transit and storage, they must be used very soon after breaking the seal to avoid the troubles just mentioned. Contents of cans left open for more than half an hour in humid air should be dried before use, and so should all reground scrap. Makers of cellulosics recommend drying as a regular procedure before extrusion, unless a two-stage vented extruder is used. Hot-air drying incidentally preheats the material, reducing power requirements, and, in many instances, increasing machine output.[1]

Polystyrenes, vinyls, and polyethylenes do not absorb water into their mass as do the materials mentioned above. On humid days, however, they may exhibit moisture troubles and it is assumed that the surfaces of the particles *ad*sorb water. Standard drying procedures remove this surface moisture easily.

### Drying methods

Two methods are in general use for drying molding and extrusion compounds, the circulating-hot-air oven and the hopper-dryer.

The hot-air oven consists of a series of trays in a closed chamber around which air is circulated by convection or forced with a blower. A small fraction of the warm air is allowed to escape and new air is bled in, to prevent accumulation of moisture in the air. Some ovens are fitted with dehumidifiers that remove some of the moisture from the bled-in air.

With a hopper-dryer, the air is forced through the material as it rests in a hopper that is either mounted directly on the extruder or molding machine, or separately mounted on a floor stand.

With either method, the correct amount of air at the correct temperature must be in contact with the material particles for a sufficient length of time to accomplish satisfactory drying.

An extensive test made by a prominent user of cellulose acetate butyrate shows that this material releases its moisture at a rate of *0.5% of the total moisture content* per minute in circulating air at 175° F. The amount of material to be dried per hour, therefore determines the size of the container, quantity of air, and temperature of the air that is forced through the material.

Unfortunately, very few data are available on *rates* of moisture loss from molding powders under the conditions prevailing in commercial drying equipment. In those resins, which will pick up water from humid air, equilibrium with the surrounding air is eventually reached and water content increases as the humidity increases. The equilibrium point also depends on the temperature, the water pick-up decreasing with rising temperature. To reduce the water content of the material, it must be brought into contact with air at a temperature and humidity such that the equilibrium water content is lower than its present water content. If the reverse conditions are set up, the material can actually be un-dried, i.e., it will pick up more water.

If in the dryer there is good contact between the air and the particles and if the air is moving over the particle surfaces at a reasonable rate, the rate of drying is probably governed by the rate at which water diffuses out

* Thoreson-McCosh, Inc., Detroit, Mich.

[1] "Preheating polyethylene and impact polystyrene prior to extrusion," P. Wilton and F. D. Marrow, Plastics Tech. 2, 158 (March 1956).

# Here's all you need to install flexible pipe of

# TENITE POLYETHYLENE

Polyethylene pipe is a booming new market for the plastics industry. For example—farmers, homeowners, and industry are finding numerous jobs for pipe made of Tenite Polyethylene because of the specific advantages it offers as a material for cold-water lines. Polyethylene pipe is now the *preferred* material for these jobs and is no longer considered a mere substitute for metal pipe.

Amazingly light in weight, pipe made of Tenite Polyethylene is easily handled even by non-professionals. It's flexible and can be curved around obstructions, practically eliminating the need for angle fittings. It's available in coils for long, coupling-free runs. Where short lengths are needed, this plastic pipe can be cut with a knife and joined with simple inserts and ring clamps. No threading is necessary. What's more, pipe of Tenite Polyethylene resists weathering and the corrosive attack of alkali soil, dissolved chemicals, and electrolysis.

Pipe is just one of many uses for versatile Tenite Polyethylene. This tough, resilient Eastman plastic also goes into electrical insulation...packaging film...coatings for paper, film, and foil...containers...housewares and many other molded products. For information about Tenite Polyethylene properties and uses, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

*An informative folder, "WHAT YOU SHOULD KNOW ABOUT FLEXIBLE PIPE MADE OF TENITE POLYETHYLENE," is available upon request.*

# TENITE
## POLYETHYLENE
*an Eastman plastic*

1932—EASTMAN'S 25TH YEAR IN PLASTICS—1957

of the plastic particles to their surfaces. If, however, the air at the surface is stagnant or very sluggishly moving, it may become saturated with water. The outward-diffusing water then begins to diffuse back in and no further drying is accomplished.

Raising the temperature helps in several ways. First, it increases the diffusion rate. Second, it increases the capacity of air to hold water. (Air at 70° F. holds only 0.0158 lb. of water/lb. of dry air, while at 175° F. its capacity is more than 30 times this figure.) Third, in the case of materials whose water content is in equilibrium with that of the air, this equilibrium, as was said earlier, is shifted in favor of drier material by raising the temperature. Of course, the temperature cannot be raised indefinitely, else the plastic may soften or be oxidized. Unfortunately, oxidation is also accelerated by rising temperature. Drying temperatures of 175° to 200° F. are recommended by the makers of nylons, cellulosics, and acrylics. However, cellulosics have a tendency to cake in the dryer when heated above 160° F., so that it is better to dry below this figure. About all that can now be said regarding rates is this: A drying time of from 3 to 16 hr. at 175° F. with good air circulation is usually sufficient to dry satisfactorily, provided, of course, the bled-in air is dry enough.

**Predry the intake air?**

The air bled into the oven need not be dried if the molding powder is not hygroscopic, even on the most humid of hot summer days. To see why this is so, it is only necessary to recall the tremendous water-carrying capacity of hot air. Air entering at 100° F. and 90% relative humidity contains 0.038 lb. water/lb. dry air. Air at 175° F. can carry 0.53 lb. water/lb. dry air. Thus the entering air can pick up over 0.49 lb./lb. If it were dehumidified to perfect dryness, its pick-up limit would be 0.53 lb./lb.; therefore, drying the intake does no appreciable good when drying materials containing surface moisture or one like polymethyl methacrylate, whose equilibrium level at these conditions seems well below the satisfactory limit for processing.

At the other end of the scale are the nylons, both type 6/6 and type 6 being extremely hygroscopic. The equilibrium data have actually been determined for nylon-6/6 and this information[2] will be used here for the purpose of illustration. Figure 1 is a chart giving the equilibrium water content of Zytel 101 at 175° F. as a function of the temperature and humidity of the bled-in air. It is assumed that the bleed ratio is sufficiently high to prevent any build-up of water in the dryer, so that the water content of the air in the oven, in lb./lb., is not appreciably higher than that of the entering air.

Depending on the requirements of the particular job being done, the water content of the molding powder will usually have to be somewhere between 0.15 and 0.28 per cent. Taking 0.20% as an example, it is clear from Fig. 1 that air entering at 70° F. and 40% R.H., typical indoor winter conditions in the U. S., is theoretically able to dry the 6/6 nylon down to about 0.13% water, and so should easily get it to the 0.20% level. On the other hand, air entering at 90° F. and 80% R.H., a condition frequently encountered inside U.S. molding plants in the summer, cannot get the resin any drier than 0.48% water, no matter how long a drying period is used. Worse yet, if nylon containing 0.30% water were kept in the "dryer" long enough under these conditions, it would actually be *undried* to 0.48 per cent! Clearly, the entering air must be dehumidified when drying hygroscopic materials during hot, humid days. In fact, if 0.20% water in 6/6 ny-

(*To page* 200)

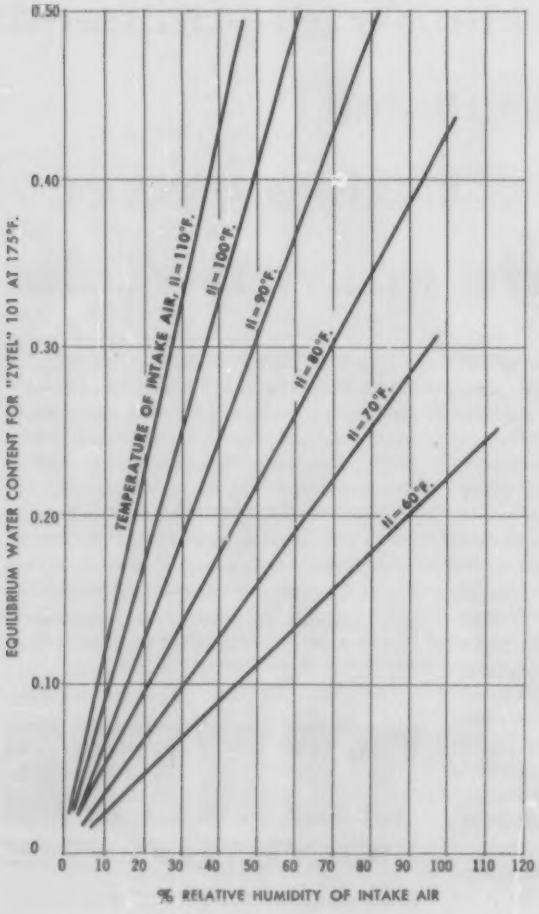
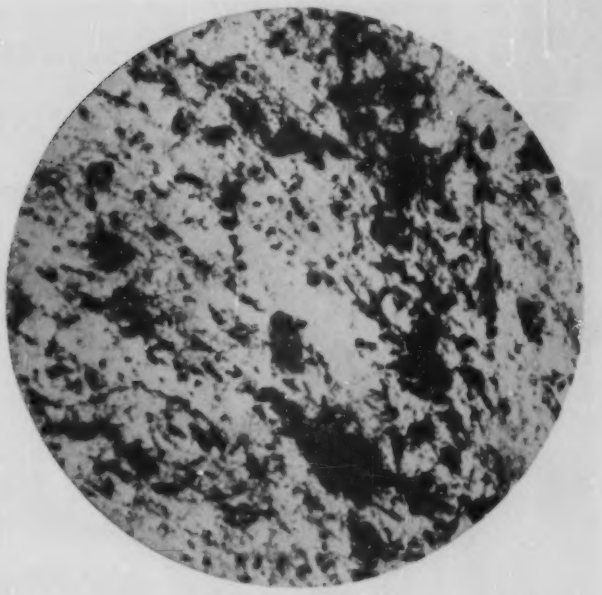



**Fig. 1:** Equilibrium moisture contents of Zytel 101 for various humidities and temperatures of incoming air

[2]Bulletin No. X-84a, "Comments on the use of drying ovens (for 6/6 nylon)," Polychemicals Dept., E. I. du Pont de Nemours & Co., 1956.

# Are your troubles caused by poor dispersions?



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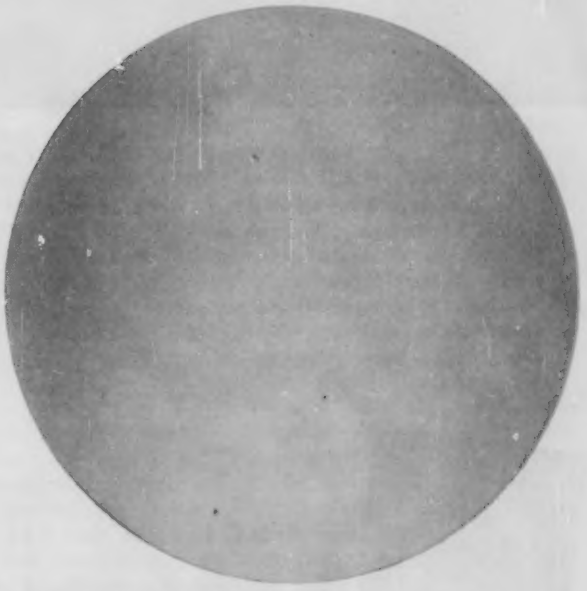

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Plastics Technical Section

Dr. Gordon M. Kline, Technical Editor

## Low-toxicity aliphatic amines for

# cross-linking polyepoxy resins

*By C. F. Pitt† and M. N. Paul†*

A series of N-hydroxyalkyl-polyamines was evaluated as cross-linking agents for polyepoxy resins. The availability of these cross-linking agents with lower skin toxicity offers a means for overcoming one of the major deterrents in the widespread utilization of epoxy resins. Using one oxirane equivalent in the resin per equivalent of amino hydrogen in the hardener, strength characteristics such as Rockwell hardness, Izod impact, flexural, tensile, and compressive values varied little from compound to compound and were essentially similar to those obtained with commercial amine hardeners. Using the A.S.T.M. heat distortion test as a criterion of the degree of cross-linking, the highest values were obtained when primary amines with three or more amino hydrogens were used for cross-linking. It was found that the pressure of terminal methyl groups in cross-linking agents had little effect on physical properties but did decrease speed of cure due to increased steric hinderance. The terminal methyl groups improved resin miscibility of the cross-linking agent, whereas compounds containing a number of hydroxyl groups were found to be difficult to mix into the epoxy resin. Chemical resistance of castings was found to be improved when slower-curing compounds were used. The presence of aromatic structures also provided improved chemical resistance. Acid catalysis in the epoxy resin reaction mechanism was found to greatly improve the room temperature cure in thin films as encountered in glass cloth hand lay-ups.

The glycidyl ether unit is the reactive functional group of the polyepoxy class of synthetic resins. One is restricted almost entirely to aliphatic polyamines possessing at least three amine hydrogens if the reaction is to be sufficiently vigorous to yield thermoset three-dimensional polymers at room temperatures and ambient conditions. These aliphatic polyamines are of a low order of toxicity when ingested orally. However, they are among the most potent primary skin irritants. This irritation is further complicated by a high incidence of allergic skin sensitization in humans as well as in test animals.

Laboratory studies[1] suggested that skin irritation and sensitization by aliphatic polyamines could be modified through the introduction of selected functional groups on the nitrogen atoms. The most effective functional group—one that still did not decrease reactivity of the parent amine with respect to the glycidyl ether group—appeared to be the hydroxy-ethyl group and its alkyl or aryl derivatives. Such hydroxyethel derivatives were prepared, and in all cases, the overall toxic levels were reduced or eliminated. Danger due to direct skin penetrations was materially reduced below the hazard level. This paper deals with the evaluation of some of these potentially attractive hydroxyethyl polyamines and discusses the most promising.

The desired properties for a cross-linking agent for polyepoxy resins can be enumerated as follows: 1) Little or no adverse pharmacological activity (minimum irritation potential). 2) Rapid cure at room-temperature ambient conditions, with longest possible working life. 3) Low viscosity. 4) Ready miscibility with the resin. 5) Low volatility. 6) Low hygroscopicity. 7) Optimum physical properties of cured castings. 8) Low cost and ease of manufacture.

While these properties are general to any "good-handling" casting compound, the toxicity problem generally encountered with aliphatic polyamines is particularly important in tooling lay-

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* Reg. U.S. Pat. Off.
Paper presented at meeting of Paint, Plastics, and Printing Ink Chemistry Div., American Chemical Society, Atlantic City, N. J., Sept. 1956.
† Development Dept., Bakelite Co., a Div. of Union Carbide Corp.

[1] "Low-toxicity aliphatic amines as cross-linking agents for polyepoxy resin. Part I," by A. K. Ingberman and R. K. Walton, preprint booklet, Paint, Plastics, and Printing Ink Chemistry Div., American Chemical Society, Atlantic City, N. J., Sept. 1956.

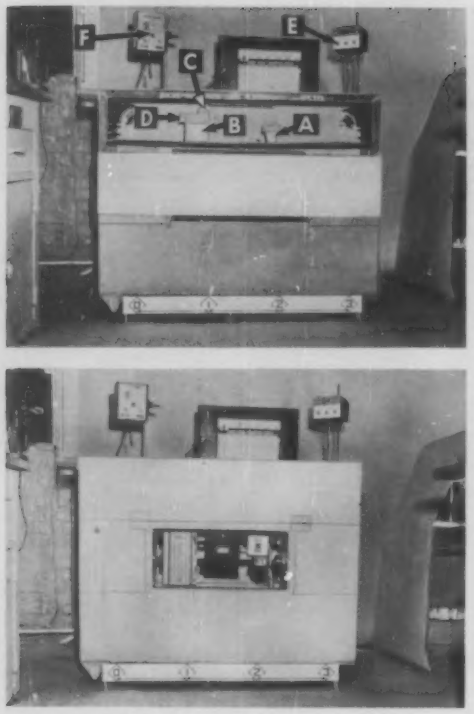


**Fig. 1:** Apparatus used to conduct standard working life test of an epoxy resin-hardener mixture at 25° F. Mixture is permitted to gel in forced draft oven while being monitored for internal temperature and mix-viscosity. Top: cabinet open; bottom: closed. A—4 oz. cup; B—454-g. container; C—thermocouple wire; D—holder; E—Caster Gelometer; F—G-E Gelometer

up, body solders for used-car reconditioning, "do-it-yourself" formulations, and hand lay-up laminates.

Compounds intended as cross-linking agents for epoxy resins were first screened for their reactivity with a standard poly-epoxide resin based on 4,4′-isopropylidenediphenol. It was believed that the S.P.I. gel curves as used with polyester resins did not provide a good practical picture of how these systems behave under normal use conditions. Therefore, a standard working life test was set up whereby a specific amount of resin-hardener mixture, at 25° C., was placed in standardized containers. This mixture was permitted to gel in a forced draft oven, while being monitored for internal temperature and mix-viscosity.

Figure 1, above, shows the 4-oz. cup (A) used to hold 50 g. of resin-hardener mix, the container (B) used for 454-g. specimens, the thermocouple wire (C), holder (D), and Caster (E) and GE (F) Gelometers. A transite, forced draft, constant temperature cabinet was constructed to facilitate these observations. Sometimes, for preliminary screening, a simple visual observation was used instead of the gelometer.

**Table I:** Working life of several hydroxyalkyl amines with Bakelite resin ERL-2774

| *Compound* | *Working life of 50-g. specimen at 25° C.* |
|---|---|
| | *min.* |
| N-(2-phenyl, 2-hydroxyethyl) DETA[a] | 18 |
| N-(hydroxyethyl) DETA | 19 |
| N,N′-bis(hydroxyethyl) DETA[b] | 24 |
| N,N-bis(hydroxyethyl)-3,3′-imino bis(propylamine) | 25 |
| N-(hydroxypropyl) DETA | 27 |
| N,N-bis(hydroxyethyl) triethylenetetramine | 28 |
| N,N-bis(hydroxypropyl) DETA | 29 |
| N,N-bis and tris(hydroxypropyl) DETA | 34 |
| N,N bis and tris (hydroxyethyl) DETA | 54 |
| N-(2-hydroxy, 2,4,4-trimethylpentyl) DETA | 57 |
| N-(hydroxypropyl)-1,2-diaminopropane | 67 |
| N-(hydroxypropyl)-*m*-phenylenediamine | 250 |

[a]DETA=diethylenetriamine
[b]N,N,N,N″ or N,N′, proably mixture of isomers.

### Gel times

Table I, below, summarizes the reactivity of a group of N-hydroxyalkylpolyamines. The time in minutes for a 50-g. mixture of resin and hardener to gel under the prescribed test conditions is given for each compound. The resin to hardener ratio was adjusted to provide one oxirane equivalent in the resin per equivalent of amino hydrogen in the hardener.

We have found that these resin-hardener combinations gel at room-temperature ambient conditions because the cross-linking reaction involving the addition of a primary or secondary amine to an oxirane ring is sufficiently exothermic to raise the temperature of the resin-hardener mixture. If no attempt is made to control the temperature of the reacting mass, these curing reactions exhibit an auto-accelerating behavior. The curing reaction, however, could be severely retarded if the masses were immersed in thermostated baths, and hence the abandonment of the S.P.I. gel test technique. It is to be expected that the setting time noted in Table I will increase with smaller masses, and decrease with larger masses. Consistent with these observations, the peak temperatures reached by these resin-hardener mixes varied approximately as the cure speed. In 50-g. masses, the fastest curing mixtures reached 230° C., while the slowest-curing mixtures showed hardly any exotherm.

Some of the slower-setting compounds showed a particular sensitivity to this mass effect; that is, in 50-g. masses they did not proceed beyond a "B" stage during room temperature cure. This fusible brittle "B" stage material is capable of further cure with heat to a solid infusible thermoset condition. This characteristic has proved attractive in

# Naugatuck VIBRIN

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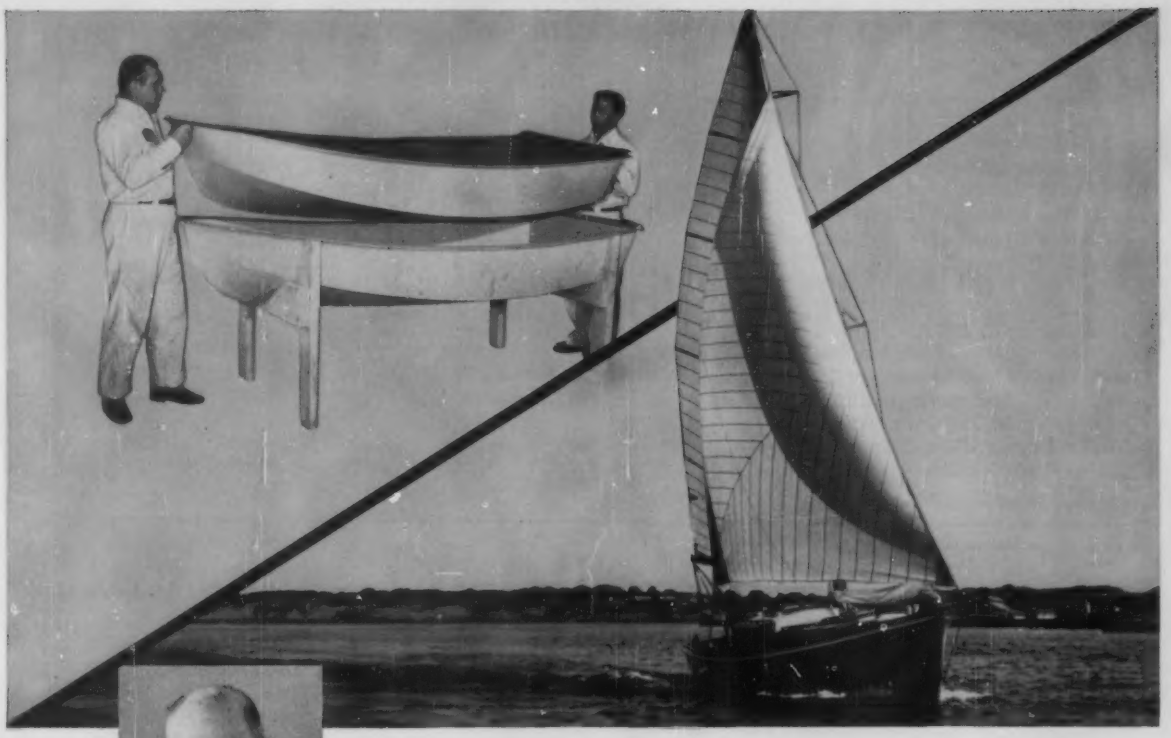

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**Table II:** Physical properties of epoxy castings made with various hardeners

| Hardener | A.S.T.M. heat distortion temp. | Ultimate compressive strength | Compressive yield strength | Ultimate flexural strength | Flexural modulus of elasticity |
|---|---|---|---|---|---|
| *MIP (Minimum Irritation Potential) types* | °C. | p.s.i. | p.s.i. | p.s.i. | $10^6$ p.s.i. |
| N,N'-bis(hydroxyethyl) DETA[a] | 58 | 45,000 | 12,000 | 14,500 | 0.500 |
| N,N'-bis(hydroxypropyl) DETA | 68 | 41,500 | 13,500 | 16,500 | 0.525 |
| N,N'-bis (hydroxyethyl) triethylenetetramine | 76 | 41,500 | 13,000 | 15,500 | 0.400 |
| N-(hydroxyethyl) DETA | 96 | 41,000 | 15,000 | 14,000 | 0.410 |
| 85 parts N-(Hyroxyethyl) DETA<br>15 parts N,N'-bis(hydroxyethyl) DETA (ZZLB-0814) | 92 | 43,000 | 15,000 | 15,500 | 0.420 |
| 85 parts N-(hydroxyethyl) DETA<br>15 parts N,N'-bis(hydroxyethyl) DETA<br>30 parts bisphenol A | 84 | 35,000 | 14,600 | 16,900 | 0.475 |
| N-(hydroxypropyl) DETA | 94 | 36,500 | 15,000 | 15,500 | 0.420 |
| N-(hydroxypropyl)-*m*-phenylenediamine | 116 | 45,000 | 19,000 | 22,100 | 0.570 |
| N-(2-hydroxy, 2,4,4-trimethylpentyl) DETA | 90 | 35,000 | 14,000 | 17,500 | 0.460 |
| N-(2-phenyl, 2-hydroxyethyl) DETA | 93 | 39,000 | 15,000 | 12,500 | 0.525 |
| *Standard aliphatic amine-hardeners* | | | | | |
| DETA/4,4'-isopropylidene-diphenol adduct | 100 | 36,000 | 16,000 | 16,000 | 0.450 |
| DETA/acrylonitrile adduct | 76 | 28,500 | 14,500 | 15,000 | 0.450 |

[a]DETA=diethylenetriamine

**Table III:** Comparison of chemical resistance of aromatic and aliphatic MIP hardeners. Gain in weight in A.S.T.M. chemical resistance test, 7 days immersion at 77° F

| Chemical | ZZLB-0814[a]/ bisphenol A adduct | N-(hydroxypropyl),m-phenylenediamine | N-(2-hydroxy, 2,4,4,-trimethylpentyl) DETA | N-(2-phenyl-2-hydroxyethyl) DETA |
|---|---|---|---|---|
| | % | % | % | % |
| 10% $NH_4OH$ | 0.40 | 0.24 | 0.19 | 0.16 |
| Ethyl ether | 0.05 | 0.10 | 0.15 | 0.06 |
| 30% $H_2SO_4$ | 0.77 | 0.76 | 0.48 | 0.24 |
| Acetone | Disintegrated | 2.37 | 6.94 | 2.82 |
| 10% NaOH | 0.29 | 0.18 | 0.12 | 0.10 |
| $CCl_4$ | 0.04 | 0.07 | 0.03 | 0.04 |
| Chloroform | 7.39 | 0.26 | 6.87 | Disintegrated |
| Trichloroethylene | Disintegrated | 0.06 | 1.49 | 0.12 |
| Glacial acetic acid | Disintegrated | 1.62 | Disintegrated | Disintegrated |
| Distilled water | 0.18 | 0.21 | 0.14 | 0.12 |
| Heat distortion temp. | 84° C. | 116° C. | 90° C | 93° C. |

[a]ZZLB-0814=N,N'-bis(hydroxyethyl) diethylenetriamine

such items as stick body-solders and molding materials. In large masses, these same systems do cure to completely thermoset masses in an orderly, well-controlled manner.

The strength characteristics, such as Izod impact strength, hardness, ultimate compressive strength, compressive yield strength, flexural strength, flexural modulus of elasticity, tensile strength, and tangential proportional limit, showed surprisingly little variation from compound to compound after a very modest cure. Of more interest is the fact that the values were essentially similar to those obtained with the current, commercial amine hardeners available in the field. Representative strength property data are given in Table II, above.

### Heat distortion temperatures

The A.S.T.M. heat distortion test (D648-45T) was found useful as a criterion of the degree of cross-linking that had probably occurred.

Primary amines with three or more amino hydrogens available for cross-linking gave the highest heat distortion temperatures. The highest value was obtained with N- hydroxypropyl-*m*-phenylenediamine, which in common with other aromatic amines used as cross-linking agents, provides a rigid linkage between the amines. All of the other compounds discussed had aliphatic linkages between the functional groups.

Terminal methyl groups (derived from propylene oxide and higher homologs) have little or no effect on the physical properties. They do, however, decrease cure speed insofar as they increase the steric hindrance in the neighborhood of the functional groups. Compounds with many hydroxyl groups were difficult to mix into the resin. For example, N,N'- bis(hydroxyethyl)diethylenetriamine is not miscible with a polyepoxide resin based on 4,4'-isopropylidenediphenol with an epoxy equivalent of about 190. Complete solution is not obtained until partial reaction with an accompanying rise in temperature occurs. Conversely, N-hydroxyethyl-diethylenetriamine is miscible in all proportions in the

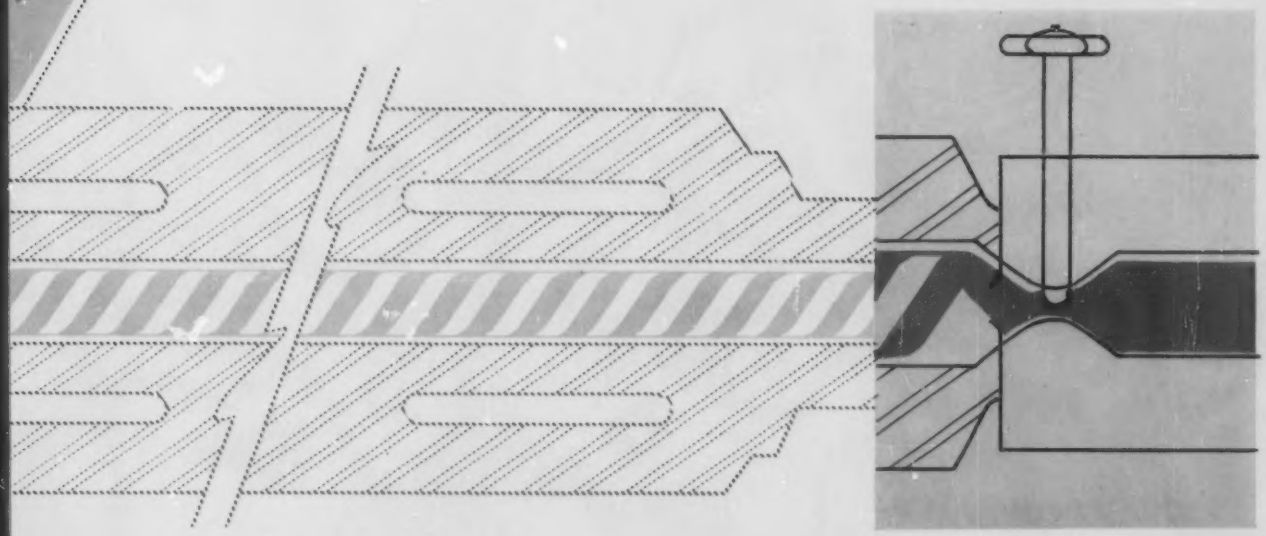
(*To page* 202)

*Improved-quality extrusions at faster rates with*

# new "controlled pressure" technique

# new BAKELITE dry-blend Vinyl Resin QYRS

BRAND



Plastics fabricators seeking faster extrusion rates have recently recognized the importance of the "pressure factor". Proper control of pressure, when achieved, will improve both mixing efficiency and product quality.

This principle has led Bakelite Company Laboratories to develop a process for "controlled pressure" extrusion. Utilizing a valve mechanism with a streamlined variable orifice, the new method permits operation of extrusion equipment at maximum capacity. Both polyethylenes and vinyls have responded with notable results.

A significant new BAKELITE Brand dry-blend vinyl resin, QYRS, emphasizes the possibilities in the new method. With pressure control, the extrusion of dry-blend resin is comparable to that of hot-flux materials.

Both of these new Bakelite Company Laboratory developments—"controlled pressure" extrusion and dry-blend vinyl resin QYRS—are described on the following pages.

## *Improved-quality extrusions at faster rates with*

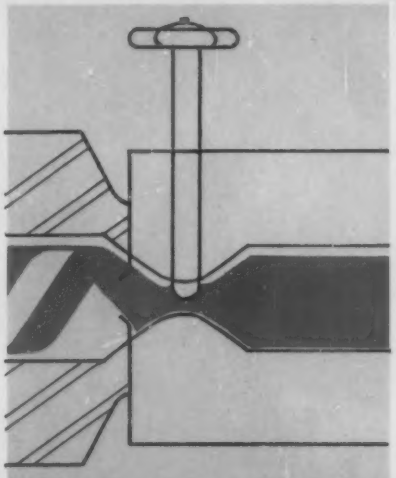
# new "controlled pressure" extrusion technique

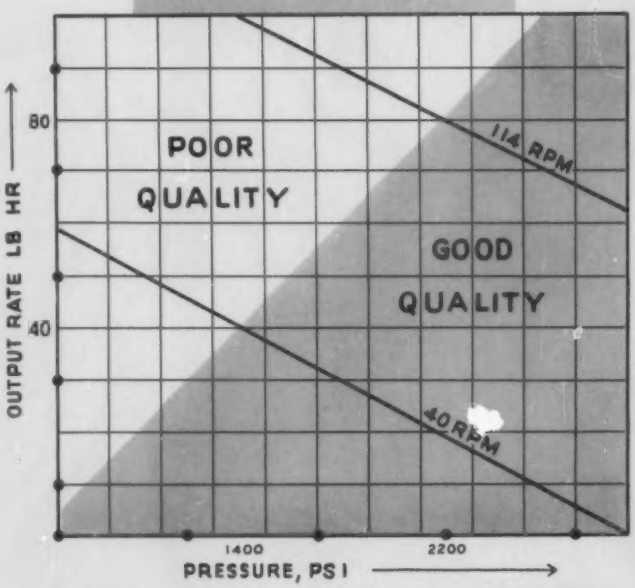
Experiments have shown that extrusion quality is related to three primary factors—pressure, resin temperature, and extrusion rate. A change in any one of these factors affects one or both of the others.

Now, Bakelite Company Laboratories have developed an efficient, accurate method of controlling pressure during the extrusion operation. Essentially, it employs a valve between the extruder head and the die, together with a pressure gauge and an immersion thermocouple in the head, or between the head and the valve.

This process provides a continuous method of control. Proper manipulation of pressure and screw speed results in better temperature control and improved resin homogeneity, better mixing characteristics and an improved product at increased output.

The development of this controlled-pressure (valve) extrusion by Bakelite Company permits operation of all extruders at their maximum capacity while maintaining highest quality.






**The above graph** on a typical sample run gives dramatic evidence of the effect of the controlled pressure (valve) extrusion technique on output. Without the valve, the highest usable screw speed, giving commercially acceptable quality, was 40 rpm. This resulted in an output rate of 40 pounds per hour or 100 feet per minute (Point A). When the streamlined controlled pressure valve was used, the screw speed could be increased to 114 rpm, *DOUBLING* the acceptable-quality production rate (Point B).

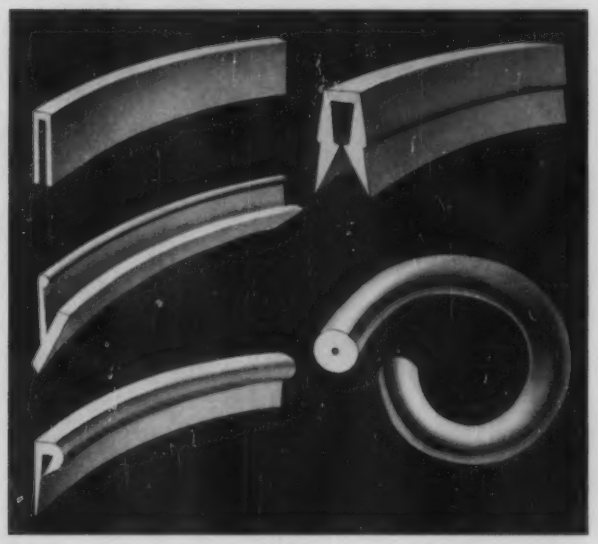
The values used in the above figure are the result of one sample test run under a typical set of extrusion conditions and should not be applied empirically to other extrusion conditions. Conditions used in this test were as follows: two inch extruder using a dry blend electrical compound based on QYRS extruded on number 14 wire with a wall thickness of 1/32 inch. Improved extrusion results, similar to those shown for wire and cable, may be expected for other applications.

# new BAKELITE BRAND dry-blend Vinyl Resin QYRS

Controlled pressure (valve) extrusion permits the extrusion of dry-blend resin comparable in quality to the extrusion of hot-flux materials. When used with BAKELITE Brand Vinyl QYRS, it results in a superior product with improved finish, reduced roughness, and minimum "fisheyes".

***Advantages of QYRS include the following:***

- **High bulk density** of 30-35 lbs./sq. ft., permitting larger tonnage output rates from a given size blender.



QYRS is desirable for preblend formulations used in both electrical and non-electrical applications. It is particularly suitable for building wire, flexible cord, appliance wire, telephone wire, power cable, and such contour extruded items as garden hose, welting, and belting.

- **High specific viscosity** of 0.205 to 0.220, resulting in improved physical properties, such as strength.
- **More uniform particle size,** ensuring maximum extrusion rate, minimum dusting, and proper dispersion of plasticizer with resin.
- **Batch-to-batch uniformity,** assuring uniform extrusions.
- **Faster dry blending time,** based on tests that prove QYRS will dry blend 10-15% faster than conventional resins while still maintaining excellent dispersion of ingredients.
- **Utilization of present cycle,** so that fabricators can use the same blending cycle as presently employed with other dry-blending resins.
- **Adaptability to a shorter cycle** as a result of faster plasticizer absorption.

For further information on the controlled pressure (valve) extrusion method and the new BAKELITE Brand dry-blend vinyl resin QYRS, write Dept. XX00

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**BAKELITE COMPANY,** *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.

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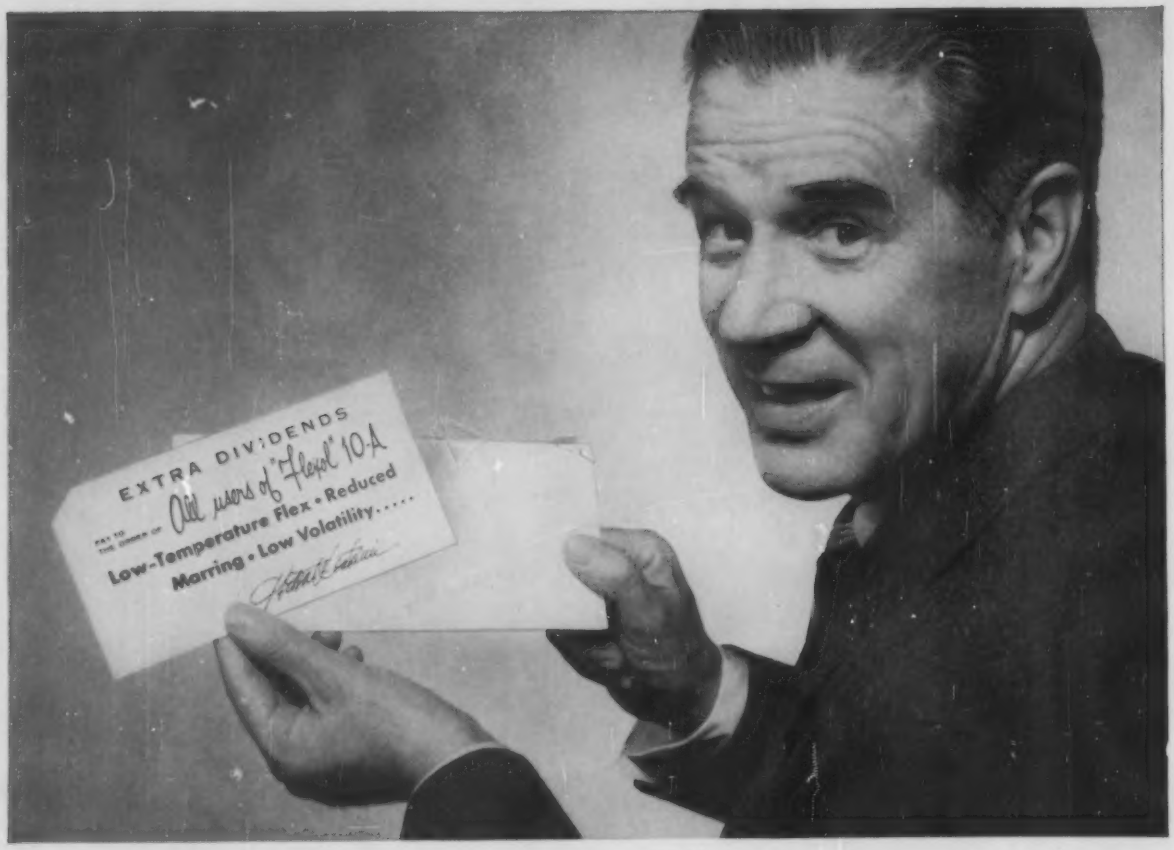


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# Formulating polyester premix molding compounds

*By John B. Crenshaw**

This paper discusses methods and materials for making polyester premix molding compounds economically. To accomplish this, a number of typical premix formulations for a variety of end uses were arbitrarily chosen. These were tested and then reformulated to correct certain deficiencies which the compounds exhibit in the mixing, storing, preforming, or finished product stages.

The general requirements and the selection of materials and mixers which relate to making a polyester premix molding compound will be discussed first, after which the formulation of actual molding compounds will be reviewed.

## General requirements

*Raw material handling:* The raw materials used should be of such a nature that they can be stored and handled as easily as possible. Liquid resins should be fluid enough to pour readily from a drum or container, a maximum viscosity of 80,000 centipoises. Fillers should be of the dense, free-flowing types to minimize dusting, lumping, or caking in handling and mixing procedures. Reinforcements should be essentially non-irritating and non-bunching. Miscellaneous additives such as mold release agents, catalysts, activators, inhibitors, viscosity adjusting agents, colorants, and others should be in a convenient physical form.

*Mixing:* The criterion is that the mixer chosen should be able to combine the raw materials in a manner to produce a uniform and reproducible compound.

*Storing:* Criteria here are shelf life coupled with drift of cure properties during storage.

*Preforming:* Compounds should be capable of being formed by hand into a compact ball and remain that way at room temperature for the shelf life of the compound, and should be extrudable in a common mechanical extruder. Extruded compounds should hold their shape and not flow into one mass in storage.

*Molding:* The compounds should mold to the desired shape without objectionable flaws. Flaws most common are dry spots, separation of components under flow, poor welding of reconverging streams, blistering, gas entrapment, pinholing, sticking, and unevenness of surface primarily because of uneven shrinkage.

*Postmold handling:* The molded part should hold its shape within the required limits and, if required, be machinable. These properties depend mainly on the choice of raw materials, the reactivity and resilience of the resin, and the abrasiveness of the fillers.

## Materials

*Inert fillers:* The inert filler system is of the utmost importance since here lies the main control of consistency, moldability, shelf life, and drift of cure properties of the compound. The choice of the major filler should be based on the resin type used, the shelf life expected and the fiber content.

Generally, premixes with low resin content can best be formulated with fillers having a spherical particle shape, such as calcium carbonate. Carbonate-filled compounds can be highly loaded with filler and are easily colored. The cured compounds have fairly good resistance to acids and mild alkalies. Some carbonates do shorten shelf life, and generally are not satisfactory when compounded with high-viscosity resins containing diallyl phthalate.

Fillers having other than round particle shapes, such as plate-shaped aluminum silicates (china clays) and magnesium silicates (talcs) and the needle-like calcium silicates (wollastonites) are very useful in compounds with diallyl phthalate-type polyester resins over a wide range of reinforcement content, and in compounds containing styrene- or vinyltoluene-based polyesters with moderate or low-reinforcement content. Compounds formulated with these fillers cannot be as highly loaded as those containing calcium carbonate and are more difficult to color. Parts molded from these compounds have better electrical properties and wet strength, and are more resistant to alkali, water, erosion, and fiber blooming.

Seldom will a single filler meet all of the requirements of a premix compound. Thus, most successful compounds contain a combination of different types and/or grade of inert fillers. The choice of premix fillers is complex in that a good aggregate is needed to accomplish maximum loading, and thereby, maximum economy and optimum physical properties. Yet the filler system must be such that it lends itself to good reproducibility and molds well. If the filler system is too spherical in nature, the reinforcement will not offer

Paper presented at the Annual Meeting of the S. P. I. Reinforced Plastics Div., Chicago, Ill., Feb. 5-7, 1957.
*Interchemical Corp., Finishes Div., Commercial Resins Dept.

**Table I:** Low-priced compound[a]

| *Compound*[b] | *A 1* | *A 2* | *A 3* | *A 4* |
|---|---|---|---|---|
| IC-1014 vinyltoluene resilient polyester, % | 30.0 | 25.0 | 31.0 | 30.0 |
| BPO (paste, 50%), added %[c] | 0.3 | 0.25 | 0.31 | 0.3 |
| Stearic acid, added % | 0.3 | 0.3 | 0.30 | — |
| Zinc stearate, added % | — | — | — | 0.6 |
| Snowflake White (calcium carbonate) (oil absorption 21-24), % | 60.0 | 60.0 | 51.0 | — |
| Paragon clay (oil absorption 40-45), % | — | — | — | 30.0 |
| #10 white clay (oil absorption 26-28), % | — | — | — | 27.0 |
| #399 magnesium silicate (oil absorption 54-58), % | — | 5.0 | 8.0 | 3.0 |
| Pigment paste, added % | 2.0 | 2.0 | 2.0 | 2.0 |
| Sisal, ⅜ in., % | 7.5 | 7.5 | 7.5 | 7.5 |
| Chopped glass fiber strand, ½ in., % | 2.5 | 2.5 | 2.5 | 2.5 |
| Shelf life, days | 9-10 | 7-8 | 7-8 | 9-10 |
| Flexural strength, p.s.i. | 8200 | 7000 | 8100 | 8400 |
| Initial flexural modulus, $10^6$ p.s.i. | 1.4 | 1.75 | 1.4 | 1.3 |
| Wet strength retention, % | 65 | 80 | 75 | 82 |
| Initial flexural modulus, wet, $10^6$ p.s.i. | 0.6 | 0.8 | 0.7 | 0.6 |
| Specific gravity | 1.89 | 1.97 | 1.87 | 1.85 |
| Raw material cost, $/lb. | 0.1536 | 0.1387 | 0.1597 | 0.1523 |
| Raw material cost, $/cu. in. | 0.01049 | 0.00987 | 0.01079 | 0.01018 |

[a]The following test methods and cost information were used throughout the tables:
1. Oil absorption: A.S.T.M. D 281-31. Values listed are expressed in cc. raw linseed oil/100 g. filler.
2. Flexural strength and initial modulus: A.S.T.M. D 790-49T.
3. Wet strength retention: A.S.T.M. D 790-49T at room temperature after 2 hr. in boiling water.

$$\% \text{ Retention} = \frac{\text{Wet flexural strength}}{\text{Dry flexural strength}} \times 100$$

4. Specific gravity of cured compound: weight—water immersion method.
5. Calculated from Oct., 1956 truckload raw material prices delivered in Cincinnati.

[b]The proprietary materials listed are those actually used, but like materials from other suppliers can be used instead if they are equivalent in chemical nature and physical properties.

[c]Added % = parts per 100 parts of basic compound.

enough resistance to flow and the reinforcement will be left bunched in the molded part. If it is too plate-like, the resin will be squeezed out of the compound as the mold closes. If it is too abrasive, the mold and finishing tools will wear excessively.

Oil absorption can be used as a guide in selecting grades of fillers. Those grades that are coarse and good aggregates, absorb less oil than those that have small and uniform particle size.

The selection of plate-like fillers —china clays, etc.—is somewhat limited in that those with oil absorption values of less than 20 seem to be non-existent.

*Resins:* The polyester resins used in premix compounds may be classified by monomer content (styrene, vinyltoluene, or DAP), and by rigidity (rigid, or varying degrees of resilience). The selection of the class of polyester resin for a specific compound depends on factors such as shelf life, volatility, drift of cure properties, reproducibility of the uncured compound, and the physical, chemical, and electrical properties expected of the molded part. In selecting a particular polyester within a particular class, the importance lies in picking one that cures soundly and can be expected to stand up under the conditions to which it is exposed after molding, rather than choosing one for its adaptability to a particular premix formulation.

A number of polyester resins made especially for premix compounds have recently appeared on the market. These resins are more adaptable to the kinds of parts usually molded from premix, but are no more easily formulated into premix compounds than their predecessors.

*Reinforcements:* The reinforcement used in any particular compound is determined largely by the properties required of the molded part.

Glass fibers chopped to lengths of ¼ to ½ in. from roving containing 150 filaments/strand generally are the best to use. Milled fibers of the same, or shorter lengths have special uses in premix compounds, but generally are more irritating to the skin, ball up in the mixer, and add little physical strength as compared to chopped roving.

Sisal cut in lengths of ⅜ to ¾ in. is also widely used in premix compounds. Sisal-reinforced parts hold up well in high humidity, but are not particularly suitable for service in direct contact with water or many other liquids.

Asbestos and other mineral fibers basically are used to control consistency and flow, although they do serve as reinforcements. These materials are used successfully in some specialized applications requiring lower water absorption rates than attainable with fibrous glass reinforcements.

### Mixers

The type and size of mixer required to produce premix compounds depends largely on the quantity and number of formulations needed and the reinforcement used. Mixers can be divided into the following types: 1) intensive-internal batch types of up to 150-gal. rated capacity (sigma-type mixers); 2) continuous drawing and chopping type such as the Brenner Molding Compound Cutter; and 3) continuous spiral rotary types.

In order to produce compounds that are easily handled and leave the mixer clean, the intensive-internal mixer should be rectangular-troughed, doubled-bladed, and have a reversible drive, a cooling jacket, and a cover. The troughs should not undercut the sides. The capacity above the top of the blades in their highest position should be about two times the capacity below the top of the blades. The blades should be spiral or "D" shaped having a spiral offset of 135 to 180° and be non-overlapping. The clearance between the blades and the shell should be 3/16 in. for mixers of

less than 5-gal. rated capacity, ¼ in. for 5 to 25 gal., and ⅜ in. for mixers rated for more than 25 to 150 gallons.

Actually, the more blade clearance there is the less fiber degradation will result, but excessive blade clearance leads to non-uniform compounds and excessive material losses on cleaning.

The speed ratio of the two blades in any mixer should be about 1.9 to 1 and the speed of the faster blade should not exceed 60 r.p.m. for a small mixer. The speed should decrease with increasing capacity to 20 r.p.m. for a 150-gal. mixer.

The choice between an intensive-internal mixer and mixers of other types should be based on the quantity of material to be made and number of different formulations required. A low over-all volume divided among many formulations for different types of products would indicate a smaller mixer. A higher volume of many different formulations would indicate a larger mixer. A low volume of one or two compounds would indicate the Brenner type machine and a high volume of one compound would indicate a continuous spiral rotary type.

The Brenner machine compounds materials of higher physical strengths at a given reinforcement content than does the intensive-internal mixer, but the variety of formulations and reinforcements that can be used is more limited.

Of the three mixers, the Brenner will produce compounds of the highest reinforcement content (easily up to 25% by volume), but the reinforcing fibers supplied to the Brenner machine must be continuous strands.

### Methods of mixing

An important step in the formulation of premix compounds is the mixing procedure. The order in which raw materials are added, the length of time they are mixed, and the temperature variations during mixing are the most critical variables to investigate during formulation.

*Intensive-internal mixes:* For experimental work the order of mixing generally most efficient is as follows: 1) add and blend dry fillers; 2) add a mix of resin, catalyst, other liquids or pastes, and mold release; 3) add sisal; 4) add mineral or synthetic fibers except fibrous glass; and 5) add fibrous glass.

With a little practice many intermediate mixes can be eliminated by adjusting the formulation in the mixer using the above procedure. The most common production procedure is as follows: 1) add resin, monomers, and catalyst system; 2) add other liquids, pastes, and mold release agents; 3) add fillers; 4) add sisal; 5) add other reinforcements except fibrous glass; 6) add fibrous glass. In either procedure a uniform mix should be attained in each numbered addition before proceeding to the next.

Variations of the above procedures are recommended to improve certain properties of the compound generally at the expense of others. One of the most important variations is to add the dry fillers to the mixer before the resin and add resin until a stiff putty is formed. This procedure sometimes reduces mixing time of compounds containing fillers that are difficult to wet but generally at the expense of drift in cure properties on storage. Another variation is to add the glass fiber before the fillers to improve surface smoothness at the expense of strength. Both of these variations and their effects on the compound are illustrated in the formulations given later in this paper.

*Brenner type machines:* In this type of machine, in which continuous reinforcement is drawn through a resin bath and orifice

**Table II:** Smooth-surfaced, high-strength compound

| *Compound* | *B 1* | *B 2* | *B 3* |
|---|---|---|---|
| IC-947 DAP resilient polyester, % | 30.0 | 30.0 | 30.0 |
| BPO (paste, 50%), added % | 1.2 | 1.2 | 1.2 |
| Zinc stearate, added % | 0.1 | 0.1 | 0.1 |
| Chopped glass fiber strand, ½ in., % | — | — | 20.0 |
| ASP 400 aluminum silicate (oil absorption 28-30), % | 50.0 | 50.0 | 50.0 |
| Chopped glass fiber strand, ¼ in., % | 20.0 | 20.0 | — |
| Mixing time to add glass, min. | 5 | 5 | 3 |
| Mixing time after adding glass, min. | 2 | 15 | 10 |
| Surface smoothness | Poor | Satisfactory | Satisfactory |
| Shelf life, days | 22 | 22 | 22 |
| Flexural strength, p.s.i. | 16,000±25% | 10,200±5% | 18,000±5% |
| Initial flexural modulus, $10^6$ p.s.i. | 1.3 | 1.3 | 1.3 |
| Wet strength retention, % | 86 | 93 | 92 |
| Raw material cost, $/lb. | 0.247 | 0.247 | 0.247 |

**Table III:** Effect of excessive glass fiber

| *Compound* | *C 1* | *C 2* | *C 3* |
|---|---|---|---|
| IC-947 DAP resilient polyester, % | 33.3 | 37.2 | 33.3 |
| BPO (paste, 50%), added % | 1.33 | 1.49 | 1.33 |
| Aluminum stearate, added % | 0.3 | 0.3 | — |
| Zinc stearate, added % | — | — | 0.3 |
| Paragon clay, % | 33.4 | 27.5 | — |
| #399 magnesium silicate, % | — | 2.0 | — |
| P3R clay (oil absorption 31-35), % | — | — | 33.4 |
| Chopped glass fiber strand, ½ in., % | 33.3 | 33.3 | 33.3 |
| Time required to add and mix in glass fiber, min. | 34 | 30 | 30 |
| Specific gravity | 1.972 | 1.925 | 1.974 |
| Raw material cost, $/lb. | 0.313 | 0.333 | 0.315 |
| Raw material cost, $/cu. in. | 0.0223 | 0.0232 | 0.0225 |

**Table IV:** Precoated and chopped glass fiber compound

| *Compound* | *D 1* | *D 2* |
|---|---|---|
| IC-671 vinyltoluene polyester, % | 50.0 | 50.0 |
| BPO (paste, 50%), added % | 0.5 | 0.5 |
| Zinc stearate, added % | 0.25 | 0.25 |
| Surfex MM (oil absorption 20-23), % | 50.0 | 48.0 |
| #399 magnesium silicate, % | — | 2.0 |
| ½-in. 150s glass fiber roving, by analysis, % | 30 | 30 |
| Flexural strength, p.s.i | — | 17,000 |
| Initial flexural modulus, $10^6$ p.s.i. | — | 1.8 |

and then chopped into convenient lengths, the method employed in mixing the bath resin is of lesser importance. The usual systems of first catalyzing the resin and monomer, and then adding fillers, then mold releases, pigment pastes, etc., applied to preform or mat molding should be followed.

**Formulations**

In the following examples are basic premix formulations that have been tried and sometimes used extensively to produce molded parts, reformulations that correct deficiencies in the basic formulas and/or parts molded therefrom, and the reasoning employed in reformulating the basic mixes to correct their deficiencies.

*Example A—Low priced compound:* A duct section is to be molded to replace a fiber board duct where the original product is satisfactory except for moisture resistance and heat-aging. Physical requirements are very moderate. Material cost must be low and processing easy. These requirements indicate the use of a compound containing a vinyltoluene polyester (for economy and fast cure), high filler loading, and a minimum of reinforcement, predominantly sisal.

The preliminary compound formulated for intensive-internal mixer (compound A 1, Table 1, p. 134) is extrudable, can be hand-formed into a shape-retaining ball, and molds well except for a tendency to warp. It is, however, very sticky and consequently cannot be removed completely from the mixer, and is messy to handle.

Stickiness can be overcome by decreasing the resin-filler ratio or by using a filler system of higher oil absorption, the former method being the more economical. By increasing the Snowflake White content to 68% a compound just dry enough to handle can be produced, but sisal bunching, more warping, and air entrapment occur in the parts molded from this compound.

The handling and molding problems are solved by compound A 2 which contains 65% filler, but the additional 5% is a high-oil-absorption talc. This compound is dry enough to handle, molds without flaw, and warps about the same as compound A 1. But the increase in filler content imparts lower flexural strength and higher wet and dry moduli.

Where the flexural strength and modulus obtained with compound A 1 is required, the resin-to-filler ratio must be increased. To avoid a return of the sticky condition of compound A 1, this increase in resin-to-filler ratio must be accompanied by an increase in the amount of high-oil-absorption filler used. Compounds A 3 and A 4 yield the desired result, but A 4 is preferred because of its low price and better properties.

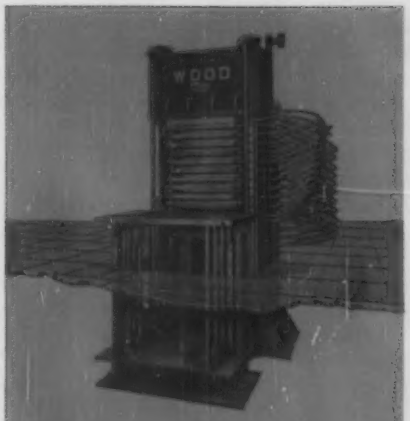
*Example B—Smooth surfaced, high strength compound:* A small housing lid requiring high strength and smooth surface and low flexural modulus is to be molded in limited quantities by a large custom molding company. The low-volume output, large-capacity mixer available, and strength requirements indicate a compound based on a polyester resin containing diallyl phthalate as the monomer, aluminum silicate, and fibrous glass.

Compound B 1 (Table II, p. 135) mixed in an intensive-internal mixer molds well and has excellent physical properties but has an uneven surface and poor reproducibility probably because of non-uniformity incurred in mixing for a short time to preserve fiber integrity and, therefore, strength. In order to improve fiber distribution and reproducibility the mixing time was increased from 2 min. to 15 min., resulting in a smoother surface, but at the expense of strength in the parts molded (compound B 2).

In order to recover the strength lost by over-mixing, compound B 3 was formulated by increasing the glass fiber length from ¼ in. to ½ in. and adding the fiber through a ¼ in. mesh screen to separate and more uniformly distribute the fibers to the catalyzed resin before adding the filler (ASP 400). Experimentation with various mixing cycles showed that a mixing time of 10 min. after adding the glass gave the best combination of flexural strength and surface smoothness

**Table V:** Low-bodied compounds

| *Compound* | *E 1* | *E 2* | *E 3* |
|---|---|---|---|
| IC-990 resilient polyester, % | 40.0 | 40.0 | 40.0 |
| BPO (paste, 50%), added % | 0.8 | 0.8 | 0.8 |
| Zinc stearate, added % | 0.4 | — | — |
| Stearic acid, added % | — | 0.4 | 0.4 |
| Paragon clay, % | 40.0 | 25.0 | 36.5 |
| C.W.F. clay (oil absorption 25-28), % | — | 10.0 | — |
| #399 magnesium silicate, % | — | 5.0 | 3.5 |
| Chopped glass fiber strand, ¼ in., % | 20.0 | 20.0 | 20.0 |
| Specific gravity | 1.79 | 1.79 | 1.79 |
| Raw material cost, $/lb. | 0.2350 | 0.2376 | 0.2355 |
| Raw material cost, $/cu. in. | 0.0152 | 0.0154 | 0.0152 |




880-ton Multiple Opening Platen Press (HydroLectric). This precision press is designed for polishing and laminating plastic sheets. Complete unit includes a 10-opening press, 20-opening loading and unloading elevator, two-pressure pumping unit and an autometic pressure and temperature control system which permits a wide variation of operating cycles. Write for catalog and engineering information on this and other R. D. Wood Hydraulic Presses for the plastics industry—without obligation.

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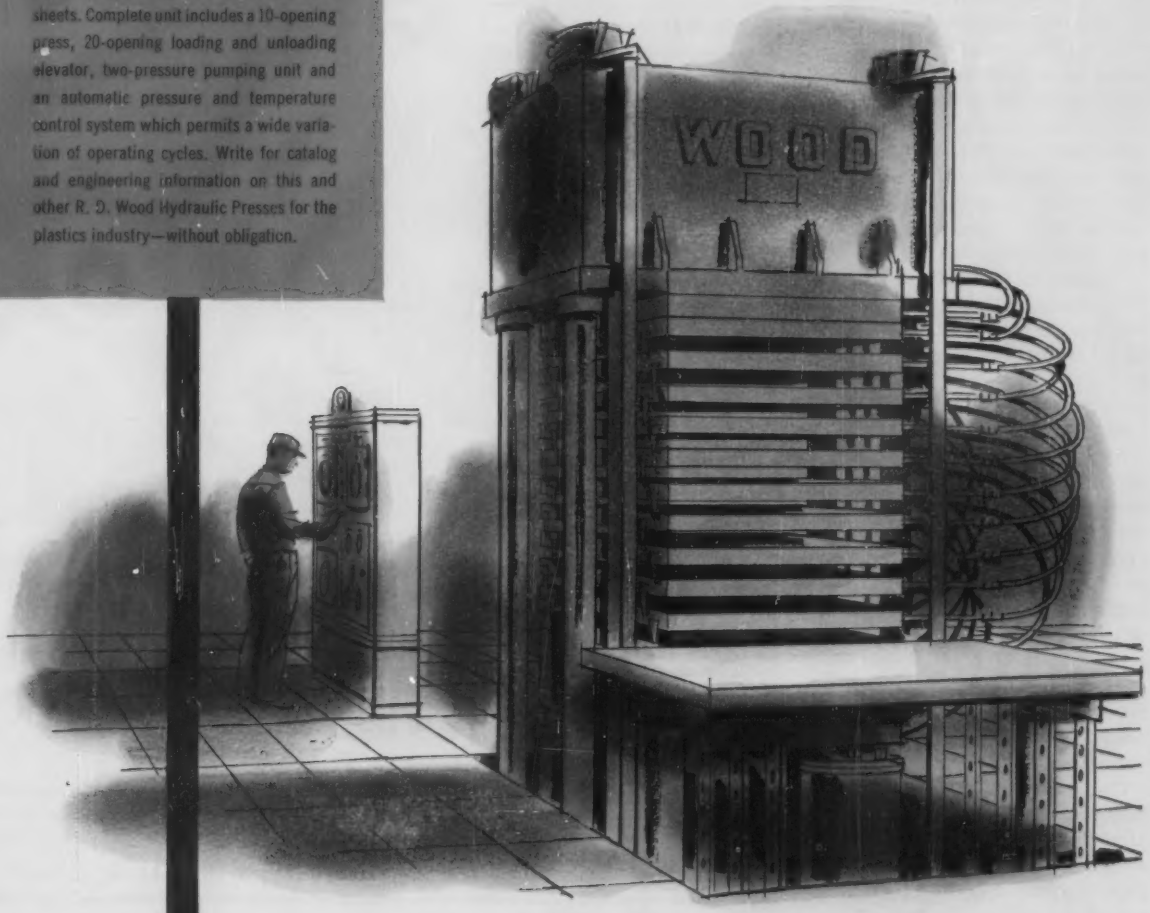


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and an entirely satisfactory process and part.

The principle of why compound B 3 regains 60% of the flexural strength lost to the over-mixing of compound B 2 to produce moldings of about equal smoothness is complex and probably particular to only this type of compound. By nature the polyester resin used here is oily and protects the fibers during the addition of the filler. Another principle is that the resin is also of high viscosity (about 50,000 cp. at 77°F.) and, therefore, does not penetrate the fiber strands until very late in the mixing cycle.

*Example C—Effect of excessive glass fiber:* A switch-gear housing is presently produced as a polyester molding reinforced with fibrous glass preform. It would be desirable to mold the part from premix to permit addition of certain functional lugs and heavier sections. The flexural strength of the present part is 30,000 p.s.i., and a value lower than 20,000 p.s.i. is not acceptable.

Compound C 1 (Table III, p. 135) having a high glass content, maximum fiber length, and a low filler content was proposed. Compound C 1 was made in an intensive-internal mixer and molded fairly well, but was dry, left a dirty mixer, would not extrude, and was messy to handle. There was some evidence of sticking in the mold, and fiber bunching. Flexural strength was poor (8000 p.s.i.), indicating poor fiber distribution, too low a resin content, or over-mixing.

Compound C 2 at a resin-to-filler ratio of 1.3 showed some improvement but still did not develop a satisfactory flexural strength.

Compound C 3 handled and molded satisfactorily. The improved flexural properties of this compound were: strength 13,200 p.s.i., modulus $1.7 \times 10^6$ p.s.i., and wet strength retention 74% (2-hr. boil). In spite of its higher glass content, this compound has poorer flexural strength than, for example, compounds B 1 and B 3 (Table II). In these compounds with excessively high glass content and long glass fibers, glass degradation both in length and in strand integrity occurs before the glass can be distributed properly throughout the mix.

Compounds reinforced entirely or in part with combinations of less fragile fibrous materials (asbestos, synthetic fibers, sisal, etc.) are presently under study. Such compounds, formulated with IC-947 DAP resilient polyester and 20 to 25% fiber (by volume) have exhibited flexural strengths as high as 25,000 p.s.i.

*Example D—Precoated and chopped glass fibers compound:* By its very nature the Brenner-type premix machine can yield compounds with high glass fiber content and relatively long fibers, yet preserve strand integrity to an extent above the capabilities of the intensive-internal mixer. The machine is not suitable for use with non-continuous fibers.

Compound D 1 (Table IV, p. 136) is a typical formulation for use in the Brenner machine. Surfex MM is used in this premix compound because it is wet easily. Compound D 1 did not flow properly in the mold. There was some evidence of fiber bunching in the molded part especially in areas of long flow. Replacement of 4% of the Surfex MM with talc (compound D 2) corrected the condition in that there was no evidence of fiber bunching.

*Example E—Effect of improper compounding and handling of low bodied compounds:* A switch-gear lever is being molded from compound E 1 mixed in an intensive-internal mixer (Table V). Satisfactory performance in extended service requires a uniform rigidity (flexural modulus) to assure toughness and shock resistance throughout each part and from part to part. Most parts are satisfactory, but an annoying proportion fail, due to variations in flexural modulus.

Compound E 1 is sticky and leaves a very dirty mixer. Many of the parts which fail show evidence of component separation. This may exist in the uncured mix or may occur in the mold because of either fiber bunching or insufficient carrying power of the filled resin.

The fiber-carrying properties of the compound were improved by replacing part of the Paragon clay with a clay of lower oil absorp-

(To page 204)

**Table VI:** Putty compound

| *Compound* | *F1* |
|---|---|
| IC-638 DAP polyester, % | 23.0 |
| BPO (paste, 50%), added, % | 0.88 |
| Zinc stearate, added, % | 1.0 |
| Smithko #2 clay (Oil absorption 40-45), % | 40.0 |
| Wollastonite F1 (Oil absorption 52-55), % | 37.0 |
| Raw material cost, $/lb. | 0.1445 |

**Table VII:** Effect of improper additions of catalyst

| *Compound* | *Catalyst added to resin-filler mix* G1 | *Catalyst added to clear resin* G2 |
|---|---|---|
| IC-947 DAP resilient polyester, % | 35.0 | 35.0 |
| BPO (paste, 50%), added % | — | 1.4 |
| Zinc stearate, added % | 0.2 | 0.2 |
| Paragon clay, % | 40.0 | 40.0 |
| R/M 348 asbestos, % | 5.0 | 5.0 |
| BPO (paste, 50%), added % | 1.4 | — |
| Sisal, ½ in., % | 20.0 | 20.0 |
| Shelf life, days | 21 | 19-20 |
| Gel time at 275°F. after storage for | *sec.* | *sec.* |
| 6 hr. | 38 | 23 |
| 1 day | 28 | 25 |
| 2 days | 25 | 21 |
| 7 days | 20 | 18 |
| 14 days | 21 | 19 |
| 19 days | 21 | 16 |

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# A method for testing quality of phonograph records

*By M. J. Gifford,* P. C. Woodland,* and R. B. Dahl**

The increasing number of hi-fi fans has encouraged the record producers and equipment manufacturers to market items that will give outstanding performance. Records that a few years ago would have been deemed satisfactory, now would be classified as inferior. In order to keep pace with the growing refinement of musical taste, record materials have had to be developed that would not only give excellent wear life but also good sound reproduction.

About the time of World War II, when the shellac sources were cut off, the phonograph record industry turned to synthetic resins for record materials. Polyvinyl chloride has become the leading record polymer because of its ease in fabrication by compression molding, its toughness, its excellent wear life, and its ability to bind high percentages of fillers. With the recent improvements in automatic, high-speed injection molding machines, polystyrene has become more important as a record material. Polystyrene, itself, does not possess good wearing properties. The coefficient of friction between the playing stylus and the polymer is very high. It is necessary to reduce the friction by compounding polystyrene with oils and waxes.[1] By proper formulating it is possible to obtain polystyrene materials that have better sound reproduction than vinyl and equivalent wear life. An example of this is shown in Fig. 1, above, which is an electron micrograph of an experimental plastic, Dow Q-936.1, molded against a grating having 15,000 lines per inch. Reproduction of this kind transformed to sound would be higher than 250,000 cycles per second. This is far (ten to fifteen times) beyond the range of the human ear.

In developing these outstanding record materials it is necessary to have adequate testing methods for measuring wear life and performance. Testing can be done visually, audibly, and by electronic instruments. By proper use of electronic methods in conjunction with the audible and visual tests it is possible to determine accurately the quality of a record material and to obtain proper injection molding conditions for best results.

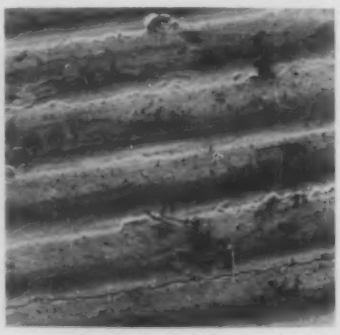

**Fig. 1:** Electron micrograph of Dow Q-936.1 molded against a 15,000 line/in. grating

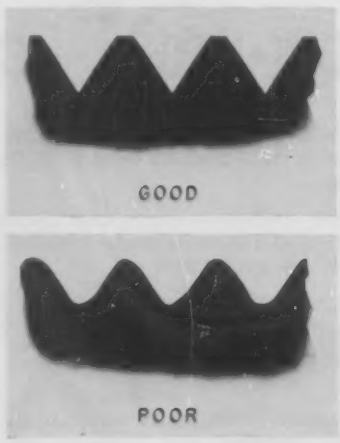


**Fig. 2:** Good- and poor-quality record grooves

### Visual testing

Undoubtedly the first testing any record gets is done visually. All phonograph records must be free from certain visual flaws. They must be flat; warped or dished records will not perform satisfactorily. The records must also be free from foreign contamination and have completely filled grooves. Surface contamination usually can be easily spotted and the record rejected, but internal contamination may be difficult to see. The same is true with grooves. A definite non fill, commonly called a short shot, is readily detected. With reflected light a trained observer can usually tell when the record grooves are not all completely filled. A completely filled groove will have sharp corners while the partially filled grooves will be rounded. A sketch of how good grooves should look contrasted to poor grooves is shown in Fig. 2, left. The most accurate method of testing groove fillage is by the use of a microscope. By breaking the record perpendicular to the grooves and placing the piece under a microscope of approximately 100× magnification the grooves can be observed. Fig. 3, p. 142 shows a photograph of a completely filled groove at 100× magnification. In Fig. 4, p. 142, 50× magnification, the grooves are not filled as is evident by the rounded corners;

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Presented at the Society of Plastics Engineers Annual Technical Conference, St. Louis, Mo., Jan. 1957.

*Plastics Technical Service, The Dow Chemical Co.

[1] Groff, F. Potter, P. B., and Smith, R. W., to Union Carbide and Carbon Corp., U. S. P. 2,681,323 (1954)

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**Fig. 3:** Photograph of completely filled record groove at 100× magnification. Note sharp corners

**Fig. 4:** Photograph of record grooves that are not completely filled, at 50× magnification

**Fig. 5:** Position of correct (1-mil) and oversized (2-mil) needles in good and poor record grooves

records with partially filled grooves will not give satisfactory performances.

**Sound testing**

If a record appears to be satisfactory after visual observation, the next logical step would be to determine how it sounds. It is important to have excellent audio equipment for testing records. The equipment should be able to reproduce the entire audible range with little or no distortion.

With proper equipment a well trained technician can tell when a record is of top quality. He is able to detect surface noise, distortion, and molding defects. The wear life can be determined roughly by listening to the record after it has been played several times.

The record grooves can also be checked audibly by using an oversized playing stylus. Fig. 5, above, shows how the needle rides in good and poor grooves when using the correct 1-mil stylus on LP records and an oversized 2-mil needle. When a record with unfilled grooves is played with an oversized stylus, the trained technician can detect definite distortion. If the grooves are properly filled no difference should be noticed between the two needles.

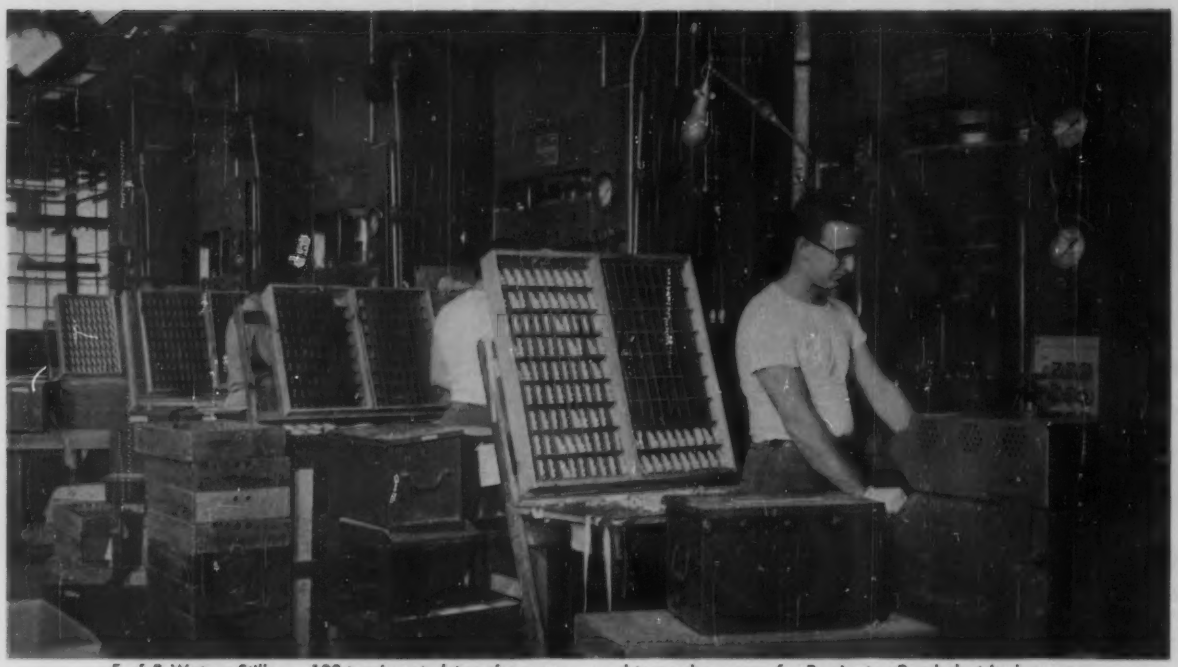
In production, records are checked for quality by visual and audible methods. For most of these tests it requires a technician who has been trained and who possesses a good ear for sound. In developing record formulations and obtaining proper molding conditions it is better to have data that do not depend entirely upon human judgment. Distortion measurements are probably the most basic and accurate indication of performance in wide-range sound reproduction. Two types of distortion measurements are often used to evaluate sound, harmonic and intermodulation distortion.

Harmonic distortion is the production of spurious frequencies that are mathematical multiples of the fundamental frequency. The addition of these spurious frequencies or harmonic multiples of the fundamental produce distortion that is not objectionable to the ear. The additional harmonics are recognized only as a change in the quality of tone. For example, middle C on a piano will sound different from middle C on another musical instrument because of the difference in harmonic content.

Intermodulation distortion (IM) is generated by the simultaneous introduction of two or more frequencies and their respective harmonics into a sound system. The interaction between these then produces new sum and difference frequencies. The harmonics of true musical notes are so related as to give a pleasing effect to the ear. It is possible, however, that the modulation produced by the combination of two or more musical tones can produce non-musical modulation products that will result in a harsh and displeasing sound. For example, if frequencies of $F_1$ and $F_2$ are introduced into a system having high IM distortion, the output of the system would produce not only $F_1$ and $F_2$ but in addition $F_1 - F_2$, $F_1 + F_2$, $2F_2$, $2F_1$, $-F_2$, $2F_2 - F_1$, etc.

Intermodulation distortion is the most sensitive of the two types and is most used. Perhaps the most important single argument for IM distortion measurements is that theoretically they should correlate well with listening tests,

**Fig. 6:** Intermodulation grooves on a test stamper



5 of 8 Watson-Stillman 100-ton inverted transfer presses used to produce cases for Remington Rand electric shavers.

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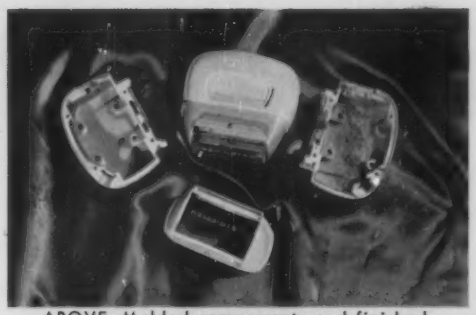

ABOVE: Molded components and finished Remington Rollectric razor.

BELOW: Removing cases from mold.

8 Watson-Stillman 100-ton inverted transfer molding machines are on the job at Remington Rand's Electric Shaver Division, Bridgeport, Conn., producing cases for the new Remington Rollectric razor. The only presses used in the production of plastic shaver cases, they've been operating 20 to 24 hours daily for the past ten years.

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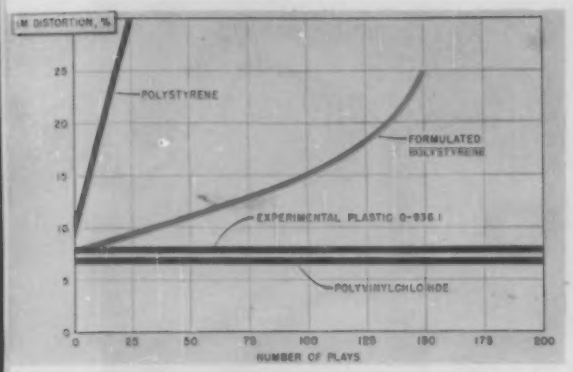


**Fig. 7:** Percent distortion versus number of plays

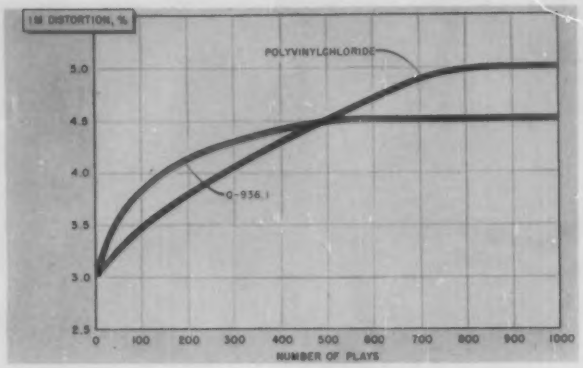


**Fig. 8:** Q-936.1 and PVC records up to 1000 plays

since they are a measure of distortion in a form that would be expected to be particularly objectionable to the listener.

### Electronic testing

By molding a special test record it is possible to obtain electronically the wear characteristics, noise levels, and other properties of the record. The test record usually contains some or all of the following: 1) a 1000 cycles/sec. band for instrument standardization; 2) intermodulation grooves for measuring intermodulation distortion; 3) a silent band for surface noise level measurements; 4) 3000 to 5000 cycles/sec. grooves for measuring harmonic distortion; and 5) a short musical selection containing a wide frequency range for detecting audible distortion.

In Fig. 6, p. 142, the intermodulation (IM) grooves of a typical test stamper are shown. The wavy lines of the IM grooves may be contrasted to the straight lines of the adjacent silent band. The intermodulation distortion is measured using an IM distortion meter. On this instrument it is possible to measure distortion levels up to 30 percent. Recordings with distortion levels below 11 to 12% probably will not be considered objectionable.

If the IM distortion of a record is measured the first time it is played and after intervals of 25 plays it is possible to plot the wear life of the record. Such a plot is shown in Fig. 7, above. Note how general-purpose polystyrene is worn out after very few plays, but by formulating polystyrene it is possible to increase the wear life considerably. Injection-molded experimental plastic Q-936.1 has a wear life that compares very favorably with that of a well formulated, compression molded, polyvinyl chloride. These two materials are further compared in Fig. 8, above. Use of IM distortion measurements in this manner will allow a formulator to determine accurately the differences between various materials and formulations.

To compare two injection molding record materials correctly, it is necessary to have each of the formulations molded at its optimum condition. The molding machine operator can tell visually whether a record is flat, and, with a microscope he can determine whether he is getting completely filled grooves. It is possible, however, to have a record that visually appears to be satisfactory and yet does not have good wear characteristics. The optimum molding conditions can be obtained by the use of IM distortion measurements.

In Fig. 9 the short shot line and the flash line, or molding area diagram, for experimental plastic Q-936.1 molded on an 8-oz. Fellows machine are shown. The

(*To page* 206)

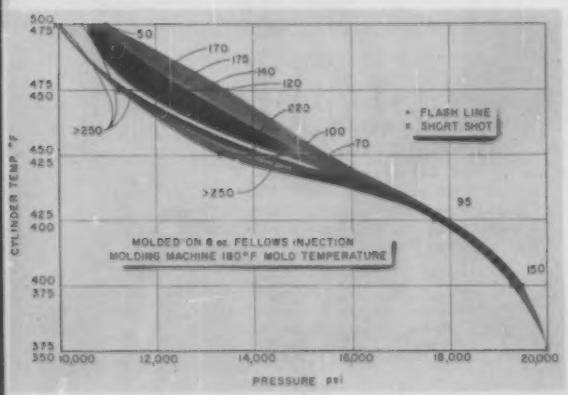
CYLINDER TEMP °F
PRESSURE psi
• FLASH LINE
x SHORT SHOT
MOLDED ON 8 oz. FELLOWS INJECTION MOLDING MACHINE 180°F MOLD TEMPERATURE

**Fig. 9:** Effect of molding conditions on wear life of records molded of Q-936.1

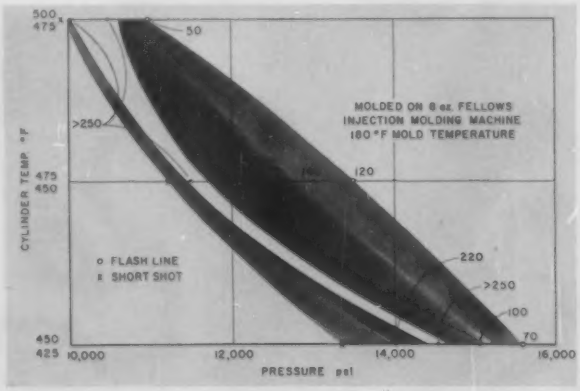
CYLINDER TEMP °F
PRESSURE psi
MOLDED ON 8 oz. FELLOWS INJECTION MOLDING MACHINE 180°F MOLD TEMPERATURE
o FLASH LINE
x SHORT SHOT

**Fig. 10:** Enlargement of left-hand upper portion of molding diagram shown in Fig. 9

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# Plastics Digest*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. For complete articles, send requests direct to publishers. List of addresses is at the end of Plastics Digest.

## General

*Encyclopedia of electrical insulation.* G. de Senarclens. Elec. Mfg. *58,* 92-99 (Dec. 1956). A progress report on a major undertaking sponsored by the International Electrotechnical Commission is presented. The prime objective is the formulation of a body of design engineering data that will facilitate on a practical level the selection of the optimum material for a specific insulating job. Detailed "group charts" of property characteristics and comparative factors are presented. Insulating materials are classified according to function, application or fabricating methods, final physical state in the end use, and certain peculiarities that influence their use. The classification distinguishes between forty groups of insulating materials. Each group combines materials that have in common the fact that they are used in the same way, that they undergo a similar change during use, and that their final state is identical; however, their physical and chemical properties may be very different. Any one group, therefore, will contain all the insulating materials that may be used by a particular technique for a specific purpose, and it is on one of them that the design choice should fall.

## Materials

*Modified polyamide resins.* G. Swann. Plastics Inst. Trans. *25,* 56-68 (Jan. 1957). Synthesis, properties, and uses of polyamide resins are reviewed.

*Nail-hard plastic drives for tough jobs.* Chem. Week *80,* 96-100 (Apr. 6, 1957). Polycarbonate plastics are made by reacting a ketone with a phenol to produce a 4,4-dioxy-diphenyl alkane and then reacting the alkane with dialkyl carbonates or phosgene. The plastics are hard and self-extinguishing, have a high impact strength and a high melting point.

*Polycarbonate; eine Gruppe neuartiger thermoplastischer Kunststoffe.* H. Schnell, Angew. Chem. *68,* 633-40 (Oct. 21, 1956). Polyesters of carbonic acid can be obtained from easily accessible 4,4-dihydroxy-diphenyl-alkanes by reaction with phosgene or by interchange of ester radicals with carbonic acid diesters. Physical and chemical properties are reported.

*N,N' - Dimethyl - N,N' - dinitrosoterephthalamide blowing agent.* M. F. Fuller. Ind. Eng. Chem. *49,* 722-30 (Apr. 1957). N,N'-Dimethyl-N,N'-dinitrosoterephthalamide makes available to producers of expanded cellular plastics and elastomers a low-temperature chemical blowing agent which decomposes thermally to nitrogen and dimethylterephthalate. The blowing agent is prepared by nitrosating N,N'-dimethylterephthalamide. It melts with decomposition in the pure state at 118° C. but decomposes at much lower temperatures in solution or admixed with many other materials. The shelf life of the nitrosoamide is satisfactory and better than most other N-alkyl-N-nitrosoamides. The blowing agent has been employed for preparing a variety of cellular plastic and elastomer compositions, especially polyvinyl chloride foams, produced at atmospheric pressure by decomposing the blowing agent prior to plastisol gelation. Success is tied to proper combinations of resins, plasticizers, stabilizers, and additives which act as foaming aids.

*Rubber-aminoplasts.* J. Van Alphen. Rubber and Plastics Age *38,* 237, 239-40 (Mar. 1957). Materials made by compounding aniline, melamine, and urea resins with rubbers are described.

*High molecular weight polyethylenes.* M. Feld. Rubber and Plastics Age *38,* 251-52 (Mar. 1957). The properties of high molecular weight polyethylenes are reviewed.

## Molding and fabricating

*What's unique about the trailing knife coater.* P. A. Peterson. Paper Trade J. *140,* 22-6 (Dec. 31, 1956). A new development in paper coating that may extend paper coating even to newsprint because of its speed, simplicity, and economy is described. The knife coater depends on a flexible trailing blade which evenly and smoothly distributes color across the face of a sheet of paper. Foam formation and the buildup of hard particles are avoided because of the clean wiping action of the blade. The lighter weight, simplified machinery permits low power consumption and maintenance costs. It may be possible by this method of coating to make bagasse, an inexpensive by-product of the sugar-cane industry, into a presentable printing sheet at a practical cost.

## Applications

*Fluidized plastic coatings for corrosion resistance.* J. A. Neumann and F. J. Bockhoff. Product Eng. *28,* 140-43 (Jan. 1957). A technique is described for coating metal objects by dipping the hot metal object into powdered plastics particles. Polyethylene, halocarbons, nylon, and polyethers are being used by this procedure to coat various metal parts to render them corrosion resistant.

*Use of PVC pastes in offset lithography.* A. E. Jackson and A. Blake. Plastics (London) *21,* 358 (Dec. 1956). A method for producing offset plates is described, consisting of applying to the surface of a paper plate a specially

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● Bumps and bruises that would often splinter an ordinary craft are shrugged off by these sturdy boats made with RCI POLYLITE polyester resin. Plastic Fabrications, Inc., Miami, Florida, reports that the inherent resiliency of RCI POLYLITE reinforced with fibrous glass allows a hull to "give" under pressure instead of offering stiff resistance — thus improving the overall strength and safety factor of their products.

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compounded polyvinyl chloride paste via a photographic stencil. The polyvinyl chloride is then gelated by heating. Whereas conventional methods yield only one plate per exposure, the stencil-polyvinyl chloride paste method is capable of giving any required number of plates from one stencil.

*Shell construction: Araldite bonds give strength to Swiss A-A missile.* W. P. Moser. Aviation Age *27*, 108-15 (Apr. 1957). The use of an epoxy adhesive in the construction of an anti-aircraft missile is described. The missile is built of sheet metal skins supported by a honeycomb core.

*Glass-to-metal seals.* T. H. Mariner. Product Eng. *28*, 188-92 (Jan. 1957). Five types of seals, design factors, and methods of bonding metals to glasses are described.

*Environmental tests for embedded electronic units.* C. A. Harper. Elec. Mfg. 116-19 (Dec. 1956). Applications for cast resin-embedded electronic units and subassemblies are steadily broadening and requirements are becoming increasingly severe. The selection of the proper embedment compound requires a painstaking evaluation. The properties of polyester- and epoxy-embedded units are compared in relation to a particular set of requirements. In general, epoxy systems are preferable where prime requirements call for resistance to environmental extremes, high dimensional stability, resistance to cracking, and superior adhesion. Where these requirements are not present, polyesters can probably be used with equal success. The polyesters have the advantages of easier handling and lower cost.

*Flexible printed conductor cables.* C. R. Heck. Elec. Mfg. *58*, 126-7 (Nov. 1956). A new type of flexible multiconductor cable in printed circuit form is described. It is made by laminating insulating material over a conductive pattern which has been bonded to a substrate of similar insulation. The new type of cable provides one solution to the problem of routing wiring harness through crowded miniaturized electronic assemblies.

**Coatings**

*New baking finishes from combinations of polyamide resins with phenolic resins.* D. W. Glaser, R. Ling, D. E. Peerman, and D. E. Floyd. Official Digest *29*, 476-84 (May 1957). Reactive combinations of certain polyamide resins and heat reactive phenolic resins, which constitute a new class of thermoset protective coatings, are described. Good storage stability, an excellent combination of toughness and chemical resistance, and handling ease characterize these coatings.

*Resin technology in Eastern Europe with emphasis on protective coatings. Part I.* C. P. West. Paint Industry Magazine *72*, 34-40 (Apr. 1957). The work of scientists and technologists in iron curtain countries in the field of protective coatings are reviewed for the years 1946-1955. Part II, 28ff. (May 1957), includes 179 bibliographical references.

**Properties**

*Cathode-ray irradiation of cellophanes.* M. Karel and B. E. Proctor. Modern Packaging *30*, 141-46, 148, 202, 205 (Jan. 1957). An investigation was made of the effects of radiation on the properties of moisture-proof cellophane. The results indicated that irradiation of these materials in contact with water may cause undesirable changes at levels of $3.5 \times 10^6$ rep or higher. These changes appear to be due to effects of radiation on the plasticizer and on the coatings. The conventional types of moisture-proof cellophane may have to be modified if they are to be used for the packaging of high moisture content foods processed by irradiation.

*Radiation effect on polymer vibration characteristics.* C. D. Bopp, W. K. Kirkland, O. Sisman, and R. L. Towns. Ind. Eng. Chem. *49*, 718-21 (Apr. 1957). Vibration testing was used to measure radiation changes for plasticized polyvinyl chloride and elastomer formulations. The dynamic modulus of elastomers is changed more than would be predicted from the effect on high elasticity owing to retardation or inelastic effects. Retardation also causes increased internal friction for elastomers, but decreased friction for viscous plastics.

*Effect of X-rays and γ-rays on synthetic polymers in aqueous solution.* P. Alexander and A. Charlesby. J. Polymer Sci. *23*, 355-75 (Jan. 1957). A study was made of the effect of ionizing radiation (X- and γ-rays) on aqueous solutions of the following vinyl polymers: polymethacrylic acid, polyacrylic acid, polyacrylamide, polystyrene sulfonate, polyvinylpyrrolidone and polyvinyl alcohol. In dilute solutions (<0.3% for the samples of polymer used) all the polymers are degraded by main chain fracture although in some cases dissolved oxygen has to be present. In others, degradation occurs in carefully deoxygenated solution but is increased by the presence of oxygen. The breakdown of polystyrene sulfonate is independent of oxygen. At higher concentration, crosslinking becomes the dominant action for all the polymers studied with the exception of polymethacrylic acid and ionized polyacrylic acid, which degrade at all concentrations. The dose of radiation necessary to produce a gel was studied as a function of concentration and passes through a minimum. No gel formation occurs below a minimum polymer concentration of about 0.4%. The results cannot be explained on the basis that indirect action by the free radicals formed in the water leads to degradation while direct energy uptake by the polymer itself produces crosslinking. Other possible mechanisms are examined. The manner by which added substances reduce the effectiveness of irradiation (i.e., protect) is discussed briefly.

*Plastics and elastomers for use in radiation fields. 1. Effects of gamma irradiation.* R. Harrington. Atomic Energy Commission Report HW-44092, 41 pp. (Nov. 30, 1956). The results obtained from exposing 48 plastics and

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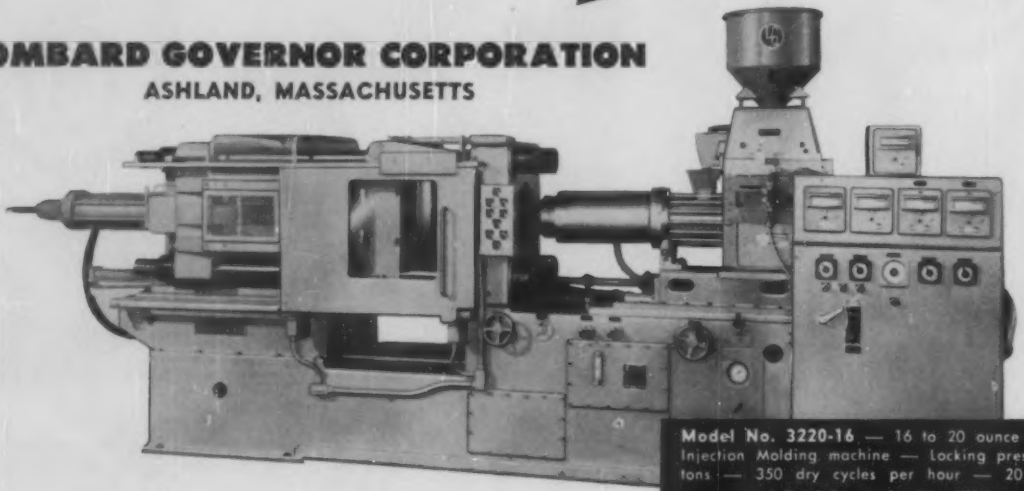

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elastomeric materials over a dose range of $3 \times 10^6$ r. to $9 \times 10^7$ r. are summarized. Spent reactor fuel elements were used as the source of gamma (ionizing) radiation. The studies were undertaken to procure practical engineering data for the design engineer. Although all of these materials will become damaged from long exposures, plastics and elastomers can, with proper evaluation and selection, be used satisfactorily in radiation fields. Among the materials evaluated, a styrene-butadiene rubber (PR 408-70) appeared to be the least affected. Two acrylic materials (Acrylon BA-12 and EA-5) and two vinyl chloride materials (Vyflex L-10 White and Black) appeared almost equally as good as the styrene. Teflon was the poorest of the materials, being severely damaged at $3 \times 10^6$ r. Kel-F elastomer and a butyl type (Hycar 2202) became soft and tacky, indicating their poor suitability for use in radiation fields. The acrylics, neoprenes, nitriles, and ethylenes appeared to be about equally damaged as classes, with some overlapping with respect to the individual materials within the classes. The silicone elastomers were generally damaged more severely, although the phenyl types were affected less. Although elongation is a sensitive property and provides a fairly good index of the degradation of the materials, a study of the effects on several properties is necessary to obtain the true condition of the materials. Report obtainable from: Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Price: 30 cents.

### Testing

*Coatings.* M. H. Swann, M. L. Adams, and G. G. Esposito. Anal. Chem. 29, 624-30 (Apr. 1957). Recent developments in methods for analyzing coatings are reviewed. 74 references.

*Measure of permeability of plastic material, leather, and similar substances against moistness and water by the hygrophotographic method.* J. Sivajian. J. Polymer Sci. 24, 63066 (Mar. 1957). The hygrophotographic method per-


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*Determination of traces of isocyanate in urethane-based polymers.* K. A. Kubitz. Analytical Chem. *29*, 814-16 (May 1957). Control of the unreacted isocyanate groups in urethane-based polymers is required to yield products of reproducible properties. Qualitative and quantitative methods for determining traces (<0.5%) of isocyanate groups in these products were developed. For the quantitative determination, the residual isocyanate is allowed to react with an excess of *n*-butylamine and the unreacted amine determined colorimetrically with malachite green. In a rapid qualitative test, a colorless secondary amine derived from malachite green reacts with isocyanate to form a colored product. Both methods are new and extremely sensitive.

### Publishers' addresses

*Analytical Chemistry:* American Chemical Society, 1155 Sixteenth St., N. W. Washington 6, D. C.
*Angewandte Chemie:* Verlag Chemie, GmbH., Pappelallee 3, Weinheim/Bergstr., Germany.
*Aviation Age:* Conover-Mast Publications, Inc., 205 E. 42nd St., New York 17, N. Y.
*Chemical Week:* McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 18, N. Y.
*Electrical Manufacturing:* The Gage Publishing Co., 1250 Sixth Ave., New York, N. Y.
*Industrial and Engineering Chemistry:* American Chemical Society, 1155 Sixteenth St., N. W. Washington 6, D. C.
*Journal of Polymer Science:* Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y.
*Modern Packaging:* Modern Packaging Corp., 575 Madison Ave., New York 22, N. Y.
*Official Digest:* Federation of Paint and Varnish Production Clubs, 121 S. Broad St., Philadelphia 7, Pa.
*Paint Industry Magazine:* Heckel Publishing Co., Inc., 1321 Arch St., Philadelphia 7, Pa.
*Paper Trade Journal:* Lockwood Trade Journal Co., Inc., 15 W. 47th St., New York 36, N. Y.
*Plastics (London):* Temple Press Ltd., Bowling Greene Lane, London E. C. 1, England.
*Plastics Institute Transactions:* The Plastics Institute, 6 Mandeville Pl., London, W. 1, England.
*Product Engineering:* McGraw-Hill Publishing Co., 330 W. 42nd St., New York 18, N. Y.
*Rubber and Plastics Age:* The Rubber and Plastics Age, 147 Grosvenor Rd., Westminster, London S. W. 1, England.

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# U.S. Plastics Patents

Copies of these patents are available from the U.S. Patent Office, Washington, D.C., at 25¢ each.

**Unicellular foams.** J. L. Lewis and C. F. Macy (to U. S.). U. S. 2,788,333, Apr. 9. Polyvinylchloride-butadiene-acrylonitrile foams.

**Foams.** B. Bennett and G. H. McFadden (to General Motors). U. S. 2,788,334, Apr. 9. Porous butadiene-styrene foams.

**Foams.** E. Barthel, Jr. (to Du Pont). U. S. 2,788,335, Apr. 9. Castor oil, epoxy resin, diisocyanate foams.

**Resin.** E. Preiswerk, K. Meyerhans, O. Ernst, E. Denz, and A. Juchli (to Ciba). U. S. 2,788,337, Apr. 9. Polyglycidyl ether resin.

**Copolymers.** M. S. Rothrock and W. K. Wilkinson (to Du Pont). U. S. 2,788,339, Apr. 9. Polyepoxy copolymers of allyl glycidyl ether and vinyl acetate.

**Plastic.** B. F. Dannels (to Olin Mathieson). U. S. 2,788,340, Apr. 9. Hard ethylene polymers.

**Pipe.** F. L. Dinsch (to Plastex). U. S. 2,788,543, Apr. 16. Apparatus for producing plastic pipe.

**Tubes.** B. Voumard and P. Monnier (to Regoma). U. S. 2,788,544, Apr. 16. Flexible plastic tubes.

**Molded articles.** W. Bauer. U. S. 2,788,545, Apr. 16. Moldable monomer-polymer mixtures.

**Molding.** R. L. Mellies and I. A. Wolff (to U. S.). U. S. 2,788,546, Apr. 16. Molding Oxystarch.

**Textile treating.** C. A. Fetscher (to Cluett, Peabody). U. S. 2,789,030, Apr. 16. Copolymer of cellulose acrylate and vinyl resins.

**Polymers.** R. J. Purvis and W. R. Beck (to Minnesota Mining). U. S. 2,789,063, Apr. 16. Activating the surface of perfluorocarbon polymers.

**Foam.** P. E. Lindvig (to Du Pont). U. S. 2,789,095, Apr. 16. Urea-formaldehyde foam.

**Resin.** H. A. Collinson (to Leicester, Lovell). U. S. 2,789,098, Apr. 16. Urea-aldehyde-furfural composition.

**Polymerization.** H. M. Rife and A. H. Walker (to Carbide and Carbon). U. S. 2,789,099, Apr. 16. Polymerization of acrylic acid.

**Vinyl chloride.** J. E. Wilson (to Carbide and Carbon). U. S. 2,789,100-1, Apr. 16. Stabilized polyvinyl chloride.

**Hollow articles.** A. Borer (to T. C. Wheaton). U. S. 2,789,312, Apr. 23. Forming hollow thermoplastic articles.

**Molding.** E. R. Knowles (to Lapin). U. S. 2,789,313, Apr. 23. Plastic bottle molding.

**Shaped articles.** J. C. Lukman and I. E. Muskat (to Celanese). U. S. 2,789,903, Apr. 23. Shaped articles of fibrous material and vinyl acetate copolymer.

**Laminate.** L. L. Yaeger (to Bjorksten Research). U. S. 2,789,932, Apr. 23. Sheet glass laminated with ethylene glycol-terephthalate.

**Resins.** E. M. Fettes and J. A. Gannon (to Thiokol). U. S. 2,789,958, Apr. 23. Polyepoxide-polysulfide polymers.

**Polymers.** R. A. Smith (to M. W. Kellogg). U. S. 2,789,959-60, Apr. 23. Perfluorochloro-olefin polymers.

**Plastic.** F. Hoelscher (to Badische Anilin). U. S. 2,789,961, Apr. 23. Styrene polymers modified with butadiene polymers.

**Resins.** A. C. Hecker (to Argus). U. S. 2,789,963, Apr. 23. Stabilizer for chlorine-containing resins.

**Polycarbonates.** D. D. Reynolds, J. Van DenBerghe, and K. R. Dunham (to Eastman Kodak). U. S. 2,789,964-2,789,972, Apr. 23. Polymeric and copolymeric carbonates.

**Polyamides.** R. N. MacDonald (to Du Pont). U. S. 2,789,973, Apr. 23. Homopolyamides.

**Molding.** R. H. Dykehouse. U. S. 2,790,203, Apr. 30. Pre-plasticizing unit for a plastic molding machine.

**Molding.** E. A. Edwards and L. A. Ulmschneider (to Eastman Kodak). U. S. 2,790,204, Apr. 30. Injection molding machine with stress-control system.

**Closures.** C. O. Pike and J. E. Snyder (to Goodyear). U. S. 2,790,-285-6, Apr. 30. Shrinkable plastic closures for containers.

**Molding.** W. Mayer. U. S. 2,790,399, Apr. 30. Machine for cutting and molding pieces from a plastic web.

**Duct.** J. F. Stephens and G. W. Kerr (to Gustin-Bacon). U. S. 2,790,464, Apr. 30. Insulated duct of bonded glass fibers.

**Bonded products.** R. H. Sonneborn and T. E. Phillips (to Owens-Corning). U. S. 2,790,741, Apr. 30. Bonded fibrous glass products.

**Polymers.** H. W. Coover, Jr. and J. B. Dickey (to Eastman Kodak). U. S. 2,790,783-4, Apr. 30. Acrylonitrile copolymers with vinylpyrrolidone and ester-amide polymers.

**Polymers.** P. O. Tawney (to U. S. Rubber). U. S. 2,790,787, Apr. 30. Polymeric maleimide derivatives.

**Polymers.** J. Kamlet (to National Distillers). U. S. 2,790,788, Apr. 30. Linear polyamides.

**Polymers.** A. L. Miller (to Celanese). U. S. 2,790,789, Apr. 30. Polymers of N-substituted unsaturated acid amides.

**Cellulose esters.** C. J. Malm, L. J. Tanghe, and L. W. Blanchard (to Eastman Kodak). U. S. 2,790,794, Apr. 30. Cellulose isobutyrate.

**Press.** J. N. Heater (to American Steel Foundries). U. S. 2,790,995, May 7. Transfer molding press.

**Casting.** R. W. Jurtz (to H. D. Boggs). U. S. 2,790,997, May 7. Apparatus for centrifugal casting of plastics.

**Film.** D. B. Peck, R. W. Hammann, and H. W. Kirkpatrick (to Sprague Electric). U. S. 2,790,999, May 7. Porous polytetrafluoroethylene film.

**Dispersions.** M. F. Bechtold (to Du Pont). U. S. 2,791,000, May 7. Dispersions of formaldehyde polymers.

**Board.** K. W. Couse. U. S. 2,791,264, May 7. Plastic structural board.

**Truck liners.** S. Levitt (to Fruehauf). U. S. 2,791,463, May 7. Plastic liners for truck trailers.

**Photographic elements.** L. Plambeck, Jr. (to Du Pont). U. S. 2,791,504, May 7. Photopolymerizable photographic elements.

**Terpolymers.** R. H. Gerke and T.

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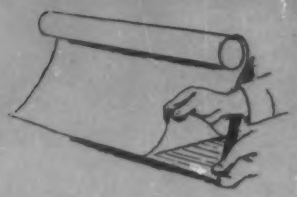

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Shevzoy (to U. S. Rubber). U. S. 2,791,518-9, May 7. Articles coated with terpolymers of butadiene, acrylonitrile, and methacrylic acid.

**Baking finish.** S. H. Shapiro and A. K. Susina (to Armour). U. S. 2,791,568, May 7. Non-yellowing melamine or urea finishes.

**Interpolymers.** G. L. Wheelock and G. P. Ferrini (to Goodrich). U. S. 2,791,571, May 7. Aqueous interpolymer dispersions.

**Molding compositions.** H. T. Bangs and R. A. Mazur (to American Cyanamid). U. S. 2,791,573, May 7. Aminoplast molding compositions.

**Polymerization.** M. Feller and E. Field (to Standard Oil). U. S. 2,791,575-6, May 7. Polymerizing olefins.

**Thermoplastics.** E. G. Schwaegerle (to B. F. Goodrich). U. S. 2,791,600, May 7. Rigid vinyl halide plastics mixed with interpolymers of alkyl methacrylates and styrene.

**Sheet.** E. Szantay. U. S. 2,791,801, May 14. Continuous production of thermoplastic sheet.

**Extruder.** H. Weber (to Celanese). U. S. 2,791,802, May 14. Thermoplastic extruder.

**Extrusion.** G. E. Henning (to Western Electric). U. S. 2,791,803, May 14. Extrusion apparatus.

**Extrusion.** J. P. Tordella (to Du Pont). U. S. 2,791,806, May 14. Extrusion of polytetrafluoroethylene.

**Fastener stringers.** L. H. Morin. U. S. 2,791,807, May 14. Plastic fastener stringers.

**Record.** C. F. Teichmann (to Texaco). U. S. 2,792,309, May 14. Phonograph record containing silicone oils and resins.

**Polymerization.** J. D. Bartleson (to Standard Oil). U. S. 2,792,375, May 14. Polymerization of styrene oxide.

**Coatings.** R. G. Binkley (to Permaplate). U. S. 2,792,376, May 14. Coatings of vinyl resin and fine metal particles.

**Plastic.** W. T. Miller. U. S. 2,792,377, May 14. Polytrifluorochloroethylene plastic.

**Polysiloxanes.** P. A. Goodwin and J. C. Caprino (to General Electric). U. S. 2,792,378, May 14. Organopolysiloxanes compounded with sulfur-dioxide-treated fillers.

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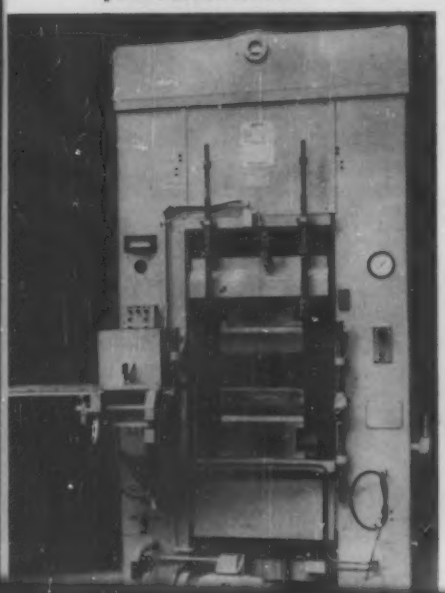
# New Machinery and Equipment*

### Automatic 60-ton press

Special features of the Bipel 60TA compression molding press include: good tool accessibility, quick change-over for top or bottom ejection, smooth-working stripper and feeder, option of running semi-automatically, and ease of set-up, making short runs economical. Feeding mechanism may quickly be altered to handle different shot sizes and to feed to 4-, 9-, or 16-cavity molds. Ejection is accomplished by a 5-ton central jack and crosshead. Powder loading gear and stripping gear are arranged at the front and back of the press and can be swung aside to give access to the tool. Both are adjustable in height. A safety device prevents closing in case of double loading or other impediment in the mold. A drum controller provides automatic control of all parts of cycle. Can be self-contained or used with central hydraulic system. Transfer-molding accessories can be incorporated if desired. U.S. representative: *Ralph B. Symons Associates, Inc., 3571 Main Rd., Tiverton, R.I.*

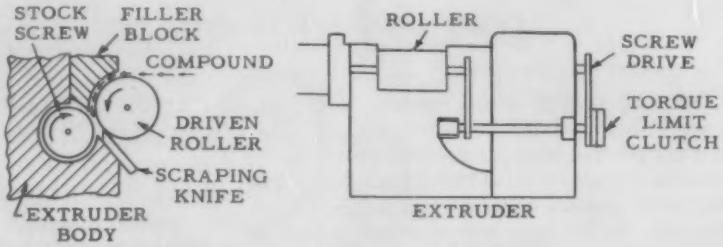
*Specifications and claims made and appearing in these pages are those of the manufacturers of the machinery and equipment described and are not guaranteed by MODERN PLASTICS.



**Bipel** Model 60TA compression press, with power feeder swung to one side to permit access to tool

### Extruder feeding device for soft stocks

A special feed section designed for Davis-Standard extruders includes a driven roller and scraping knife that makes feeding of strip stocks more reliable. The highly polished pressure roller is driven from the main drive via a torque-limiting clutch. The clutch slips at a predetermined load, thus maintaining a constant feed pressure in the throat of the screw. Regulation is said to be within 1% on stocks that formerly were difficult to feed even by hand. The feeder can be adapted to present D-S extruders in the field, in the sizes from 2 to 6 inches. At present it has not been adapted to other makes. *Davis-Standard, Mystic, Conn.*




**Davis-Standard** pressure roller feeder for extruders

### Roll leaf stamping press

The Kensol 110 is an air-operated press designed to roll leaf stamp items from flat up to 24 in. high, with impression areas of either 6 by 8 in. or 9 by 12 inches (greater widths on special order). Head may be driven by one or two air cylinders having a 3-in. stroke; 500-w. cartridge heaters are supplied, controlled by Robertshaw thermostats. Dwell timer regulates printing time in 0.1-sec. intervals to 6 seconds. Longer stroke, sliding table, or turntable available as extras. Depth of throat is 7.5 inches. *Olsenmark Corp., 124 White St., New York 13, N.Y.*

### Injection molding equipment

A pneumatic feeder for molding powder and a new stock replacement cylinder are offered by IMS. The feeder can lift up to 30 lb./min. to heights up to 60 feet. The bin holds about 750 lb. of polystyrene molding powder. Feed is blown through 3-in. connecting tube (not furnished) to discharge cyclone mounted on machine hopper. Entering and exit air streams are filtered.

The extra-capacity heating cylinder is designed for Lewis 4-oz. injection machines. It requires no alteration of the machine, consumes 8 kw. *Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20, Ohio.*

### Versatile heavy-duty forming machine

The Formvac U-5 is built to stand rough treatment and is intended for the forming of industrial products. The usable molding area is 40 by 60 in., with a maximum draw (usually limited by the sheet's melt strength) up to 24 inches. Clamping frame develops a locking force of 11 tons, permitting reliable forming of sheets up to ⅜ in. thick. Edge loss is ¾ in. or less.

Once heated, the sheet is formed very rapidly, the whole forming

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**MODEL H-250 PRESS 2½ OZ.**

**is FAST!**

Up to 1200 cycles per hour (dry run)

## AUTOMATIC!

One operator can run 3 or more presses, for greater flexibility, and lower labor costs. Selective control permits semi-automatic operation.

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by semi-skilled help. With simple, handy controls, job can be set up in 20 minutes.

## VERSATILE!

The sketches list only a few of the many thermoplastics molded on Van Dorns.

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Polystyrene Containers — over 720 per hour

Vinyl Cord Sets — over 2000 per hour

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**Remember, For the Price of One Large Press, You Can Own a BATTERY of VAN DORNS!**

SEMI-AUTOMATIC PRESS 2-oz. capacity.

POWER OPERATED, LEVER CONTROLLED PRESSES 2-oz. and 1-oz. models.

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PLASTIC GRINDER Grinds up rejects, waste, etc., for re-use.

MOLD BASES Available from stock.

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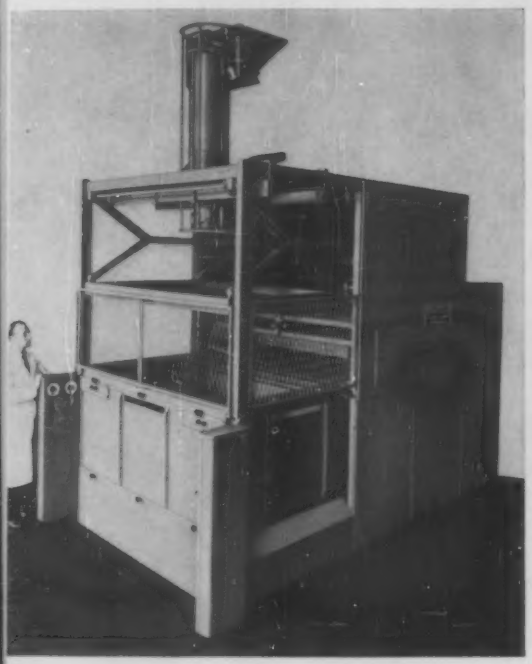
operation being complete in two seconds, regardless of the final shape. To accomplish this, the vacuum system uses 3-in. piping, a 260-gal. surge tank, and a 140-cu. ft./min. pump. Recovery time after largest possible shot is 36 seconds. The "dropform" or plug-assist technique is also fast, the full stroke being accomplished in 0.7 second. The machine also incorporates Formvac's "airslip" technique, in which the sheet is first stretched by blowing to gain elongation before imparting the final shape. By combining these techniques it is possible to make double-walled containers, or a refrigerator door liner and outer shell in one piece, or a bookcase with double-walled sections constituting the top, bottom, sidewalls, and shelves (see diagrams).

Heaters are low-temperature, long-wave type, subdivided into control cells to facilitate uniform heating. Cycle timer governs interval in each of four zones. Heater idles at ¼ full power, which makes for little build-up but fast recovery. Top heater power is 40 kw.; average consumption is about 27 kw.

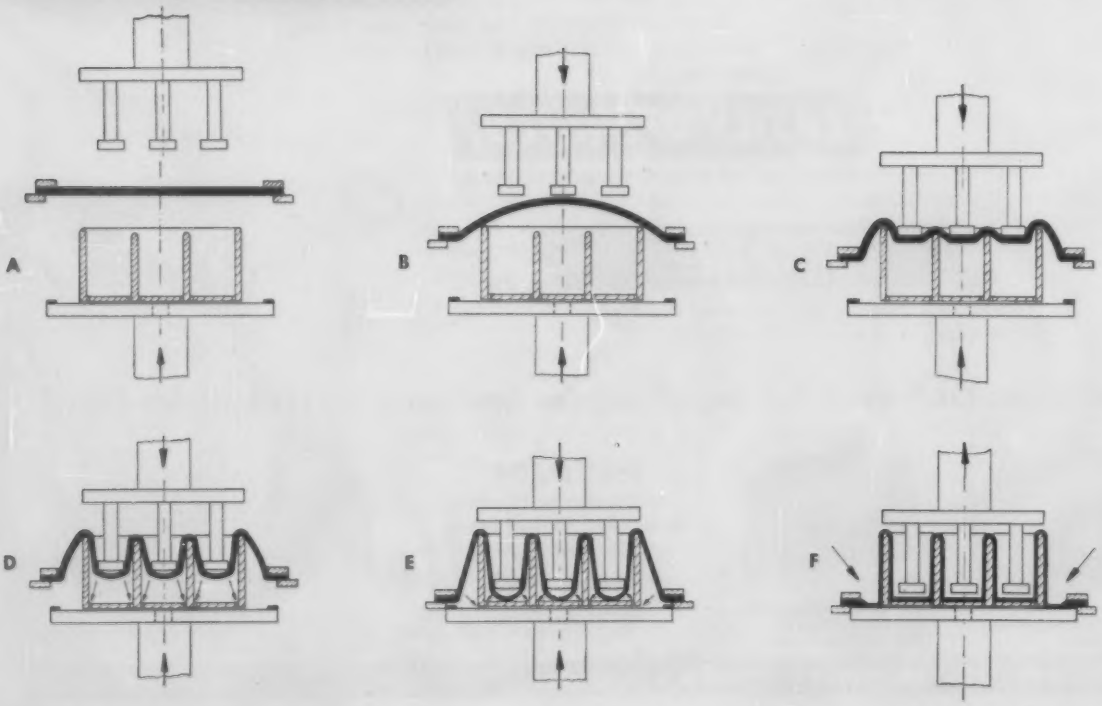
Vacuum pump rating is about 9.5 hp.; air required is 60 cu.ft./min. at 80 p.s.i. *Hydro-Chemie Ltd., P.O. Box 22, Zurich, Switzerland.*



**Forming a double-walled** section in Formvac U-5 (left): *A*—table rises, inflating hot sheet; *B*—with table still rising, plug descends; *C*—plug and table converge, both engaging sheet; *D*—rising table trips vacuum switch and sheet is drawn into cavities; *E*—with table and plug still converging, sheet is formed by combined plug and vacuum action; throughout phases *C* to *E*, airslip action keeps sheet away from mold walls to prevent marring; *F*—sheet is fully formed and plug is retracting. Plug can be kept down when forming sharp contours

### Laboratory intensive mixer

The No. 0 spiral-flow mixer is conveniently sized and provided with a variable-speed drive for laboratory experiments in mixing. Chamber capacity is 1 gal. (231 cu. in.), which gives a working batch size of about 6 pounds. Temperatures up to 550° F. are feasible. Spiral flow side jackets have "turbulated" passages for efficient heat transfer. The compact 25-hp. drive can be either a 4-speed a.c. motor or a variable-speed d.c. motor with an 8:1 speed range. Counter-rotating spiral mixing rotors are set in long-lived roller bearings. Split end frames permit rotors to be



lifted upwards for replacement rather than be pulled endwise. Accessibility to mixing chamber is said to reach a new high. *Stewart Bolling and Co., 3190 E. 65th St., Cleveland 27, Ohio.*

**Gulletless circular saw blade**

The "Flying Cutter" is a circular saw that has virtually no dip or gullet between its teeth. The carbide teeth are welded into the rim of the saw blade (see cut) so that they protrude slightly above the circumference. This construction, it is claimed, eliminates grabbing and saw-cut flash. It is satisfactory for thin plastic extrusions that cannot be cleanly cut with conventional saws. Ten to thirty times as many cuts can be made between sharpenings as with conventional blades. *Lemmon and Snoap, Grand Rapids 4, Mich.*

**Portion** of Flying Cutter saw blade, showing carbide teeth welded into rim

**High-speed oven dryer**

The Vits "Lay-on-air" drying oven for plastics laminating combines special aerodynamic construction with a high-velocity, single-jet drying system. Its makers claim it uses very little floor space for its capacity. A 30- to 35-ft. oven, for example, can dry 30 yd./min. of melamine-treated fillers. Four axial fans force the drying medium down through flutes into the jets that vent it perpendicularly against the filler. Temperatures up to 572° F. are possible; volume circulation rates up to 3.5 to 4 million cu. ft./hr. are attained. *Cosa Corp., 405 Lexington Ave., New York 17, N. Y.*

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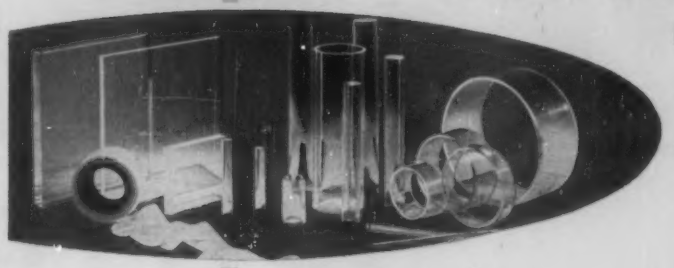

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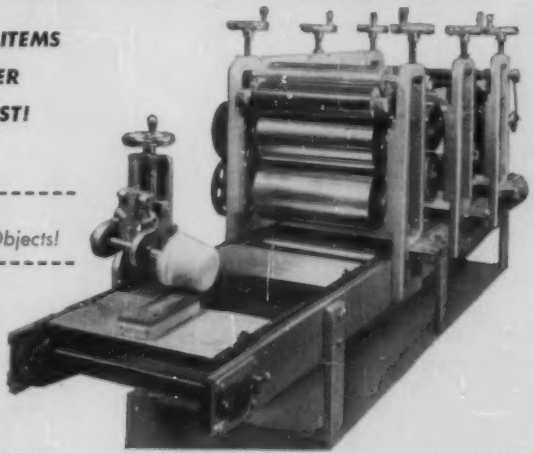

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# Books & Booklets

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

**"Kunststoffe—Eigenshaften, Erzeugnisse, Bezugsquellen"**

Published in 1956 by Julius Dressler, Buch- und Zeitschriftenverlag, Schwindgasse 5, Wien IV, Austria. 208 pages. Price: S 10 (ca. 40¢).

Published under the aegis of the Plastics Processing Group of the Austrian Chemical Association and the Austrian Society of Plastics Processors, this little volume gives a brief summary of the more important properties of plastics; an alphabetical and classified list of plastics processors in Austria; and several chapters on broad areas of plastics applications. Among the latter are such topics as building construction, pipe, flooring, household, packaging, and others.

**Pressure tubing.** Outstanding characteristics and installation advantages of Nylaflow flexible polyamide tubing, along with available sizes and information on where it can be used advantageously. Bulletin BR-3A. 4 pages. *The Polymer Corp. of Pennsylvania, 2140 Fairmont Ave., Reading, Pa.*

**Vacuum equipment.** Price list and product index for over 400 items of industrial and laboratory high vacuum equipment including standard components, packaged systems, and engineered plants manufactured and sold by the company. 16 pages. *NRC Equipment Corp., 160 Charlemont St., Newton Highlands 61, Mass.*

**Plastics dinnerware.** Full color booklet, "Easy Ways to Make Beautiful Table Settings," shows how various Melmac melamine dinnerware sets, silver, accessories, floral decorations, etc., can be arranged in different ways to heighten the dramatic effect of the table. Price: 25¢. 36 pages. *American Cyanamid Co., P.O. Box 20, New York 10, N. Y.*

**Injection molding machines.** Engineering data, features, specifications and prices of Minijector plastics injection molding machines for solving small (⅛ to 1 oz.) injection molding problems. 32 pages. *Newbury Industries, Newbury, Ohio.*

**"Premium Use and Supply,"** surveying some 15,000 firms in the manufacturing, retailing, direct selling, and advertising agency fields, should be of interest to a large area of American business, since a premium is defined as "any article of merchandise given away or sold at a reduced cost as an incentive to make extra sales." Price $1.00, 32 pages. *Premium Advertising Assn. of America, 608 Fifth Ave., New York, N. Y.*

**Vinyl resin.** Typical properties of Pliovic 850, a low-viscosity, general-purpose vinyl resin; its viscosity relationship to other Pliovic resins; suggested applications; and a Pliovic price list. Types and Properties Sheet 57-105. 2 pages. *Chemical Div., The Goodyear Tire & Rubber Co., Akron 16, Ohio.*

**Plastic alloys.** Applications, characteristics, properties, and uses of Resiweld plastic alloys, high-strength, permanent bonding agents. Bulletin RTB-60S. 4 pages. *H. B. Fuller Co., 181 W. Kellogg Blvd., St. Paul 2, Minn.*

**Flexible plastic pipe.** Physical properties, specifications, applications, friction loss comparisons, and suggested installation instructions for Dur-X flexible plastic pipe. Information on fittings is included. 16 pages. *Franklin Plastics Inc., Franklin, Pa.*

**Automatic molding presses.** General specifications and outstanding features for 60-, 75-, 100-, 150-, 175-, 200-, 300-, and 450-ton self-contained, automatic, hydraulic molding presses. Bulletin No. 14. 8 pages. *Baker Brothers, Inc., Toledo 10, Ohio.*

**Lawn sprinkler systems.** "A Beautiful Lawn . . . At a Twist of your Wrist," describes the types of sprinkler systems using polyethylene pipe now on the market, how they are installed, approximate costs, and advantages over "garden hose watering." Lists sprinkler system suppliers. 14 pages. *Spencer Chemical Co., Dwight Bldg., Kansas City 5, Mo.*

**"Products Derived From Coal,"** latest version of this copyrighted chart contains a large number of derivatives not listed in previous issues. *Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.*

**Plastic tooling.** "Bibliography of Material Related to Plastic Tooling" lists 254 items with abstracts written by Orville D. Lascoe, Prof. of Industrial Engineering, Purdue University. Subject and author's indices are included. Research report No. 5. 54 pages. *American Society of Tool Engineers Research Fund, 107000 Puritan Ave., Detroit 38, Mich.*

**Structural adhesives.** General information, a selection chart, and characteristics and properties of six Resiweld structural adhesives based on epoxy resins. Technical bulletin RTB-10A-1. 4 pages. *H. B. Fuller Co., 181 W. Kellogg Blvd., St. Paul 2, Minn.*

**Injection machines.** Performance and general specifications for four new 2¾-oz. plastics injection molding machines. 4 pages. *Clifton Hydraulic Press Co., 289 Allwood Rd., Clifton, N. J.*

**Polyolefin resins.** "Ferro Basic Colors for Polyolefin Resins (high-density polyethylene)," Code

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| Molded Specific Gravity | 1.35-1.37 |
| Heat Distortion Temperature °F. | 290 min. |
| Water Absorption | 0.5% max. |
| Tensile Strength | 6,500 psi min. |
| Flexural Strength | 9,000 psi min. |
| Compressive Strength | 30,000 psi min. |
| Impact Strength, Izod. | 0.30 ft. lbs./in. of notch, min. |
| Dielectric Strength, Short Time | 300 volts/mil, min. |
| Dielectric Strength, Step by Step | 200 volts/mil, min. |
| Dielectric Constant @ 1,000 cycles | 7.0 max. |
| Power Factor @ 1,000 cycles | 0.07 max. |

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**Formulations.** "For Products Waiting to be Made" lists a few of the company's vinyls, lacquers and synthetics, and epoxies and describes a number of interesting applications they have found in various industries. 4 pages. *The Stanley Works, 111 Elm St., New Britain, Conn.*

**Products for plastics.** Application and data sheets on adhesives for plastics, cleaners and polishers for polystyrene or acrylics, external coloring agents, and coatings for general use and by metallizers. *Schwartz Chemical Co., Inc., 328 W. 70 St., New York, N.Y.*

**Control instruments.** General information, operational data, applications, and outstanding characteristics of Consolidated-Phillips Type 38-202 process refractometer. Bulletin 1833. 8 pages. General information, applications, flow diagrams, accessories, and prices given in new product announcement of Type 21-611 mass spectrometer. 6 pages. *Consolidated Electrodynamics Corp., 300 N. Sierra Madre Villa, Pasadena, Calif.*

**Hydraulic tracer valves.** Brief descriptions, outstanding characteristics, and applications of hydraulic tracer valves, together with a schematic drawing of a model. 5 pages. *Machine Works, Inc., 2114 W. Rosecrans, Gardena, Calif.*

**Fillers.** "ASP Fillers for Premix Molding Compounds Thermosetting Type," T.I. 254, contains sections on uniformity of fiber-filler-resin distribution; control of shrinkage; moldability; handling; pot life; resistance to chemical and water attack; dispersion; non-abrasiveness; dielectric properties; compatability with special additives; surfaces; and choice of particle size grades. 11 pages. *Minerals & Chemicals Corp. of America, Menlo Park, N. J.*

**Semi-finished components.** Equipment and components of Agilene polyethylene; Agilene-HT, high-temperature, high-tensile polyethylene; Agilide, unplasticized polyvinyl chloride; and Agilux, high-impact polyvinyl chloride. 8 pages. *American Agile Corp., P. O. Box 168, Bedford, Ohio.*

**Containers and closures.** Catalog lists plastics and glass containers according to size with drawings and specifications. Cross reference indicates other sizes and refers back to the display section which shows the bottles in perspective. 104 pages. *W. Braun International Co., 500 W. Fulton St., Chicago 6, Ill.*

**Plastics research.** Two reports entitled "Plastics Materials for Vision Devices" describe the development of optional plastics

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with abrasion resistance approaching that of glass. Formal Report No. 1 (PB 121027), Price: $1.00. 38 pages. Final Report (PB 121028), Price: 50¢. 14 pages. *Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C.*

**"New tung oil derivatives."** Several compounds developed from tung oil derivatives show promise as plasticizers, are reportedly superior in some properties to DOP and TCP. Report ARS-72-7. *Southern Utilization Research and Development Div., U. S. Dept. of Agriculture, 1100 Robert E. Lee Blvd., New Orleans 19, La.*

**Polyethylene resins.** Basic characteristics, outstanding properties, and recommended applications of Alathon polyethylene resins for packaging. 8 pages. *E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.*

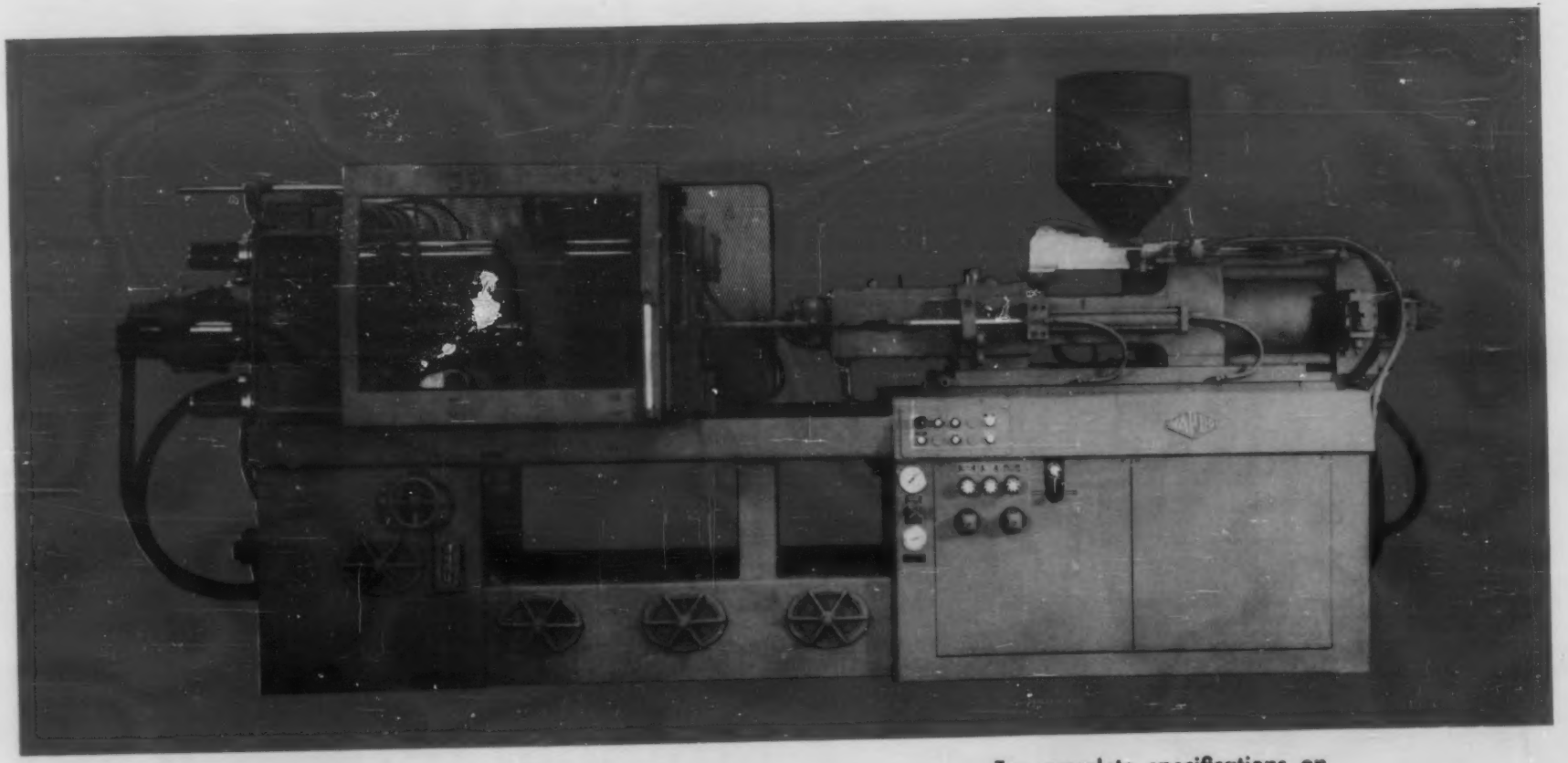
**"Directory of Consulting Engineers"** lists the names of ASME members engaged in consulting work and consulting engineering firms with which ASME members are associated. The 1200 names and addresses are arranged geographically with each entry indicating the type of consulting service performed. Price: $2.50. *The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.*

**"The Epoxylite Story"** discusses use of epoxy resins, applied by the special Epoxylite process, for protecting all forms of large electrical apparatus. Cost comparison data and a number of case histories. 24 pages. *The Epoxylite Corp., 10829 E. Central Ave., El Monte, Calif.*

**Standards.** NBS Circular 552 (second ed.), superseding Circular 552 issued Aug. 1954, contains up-to-date descriptive listing of various Standard Samples issued by the National Bureau of Standards. A schedule of weights and fees and directions for ordering are given. Price: 25¢ (available free to prospective purchasers of Standard Samples, upon request to the National Bureau of Standards, U. S. Dept. of Commerce, Washington 25, D. C.). 24 pages. *Superintendent of Documents, Government Printing Office, Washington 25, D. C.*

**Glass-plastics.** Available sizes, grades, prices, properties, and applications for complete ranges of glass fabrics and fibers, polyester and epoxy resins, catalysts, and other materials necessary for reinforced plastics. 14 pages. *Cadillac Plastic & Chemical Co., 15111 Second Ave., Detroit 3, Mich.*

**Protective linings and coatings.** Case history of how detergent-hauling rail tank cars were protected from premature failure at the critical area of rivet heads and edges. Also other services available from the company—sheet linings, sprayed metal coatings, synthetic resin coatings, combination coatings, sand and grit blasting, fabrication, and ma-



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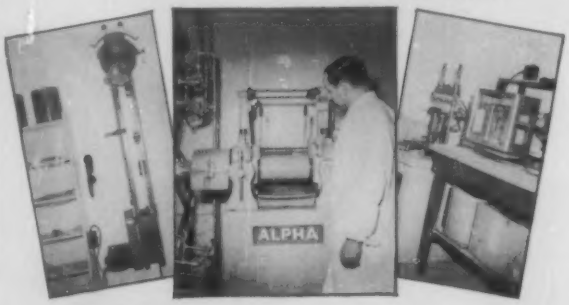


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jor repairs. 4 pages. *Coatings Div., Metalweld Inc., Scotts Lane and Abbottsford Ave., Philadelphia 29, Pa.*

**Epoxy paints.** Suggested formulations of epoxy/liquid polymer paints for marine, aircraft, industrial maintenance, and railroad car applications. 7 pages. Leaflet entitled "Epoxy Paints Have Wider Applications . . . Longer Life . . . with Thiokol Liquid Polymer" contains a sample metal strip sprayed with an epoxy/Thiokol liquid polymer to illustrate its improved resistance to chemicals and water. *Thiokol Chemical Co., 780 N. Clinton Ave., Trenton 7, N. J.*

**Centrifugal collectors.** Description of two new types and an explanation of the wide range of industrial applications for each in efficient air cleaning and dust collecting with centrifugal force. 6 pages. *The Kirk & Blum Mfg. Co., 3120 Forrer St., Cincinnati 9, Ohio.*

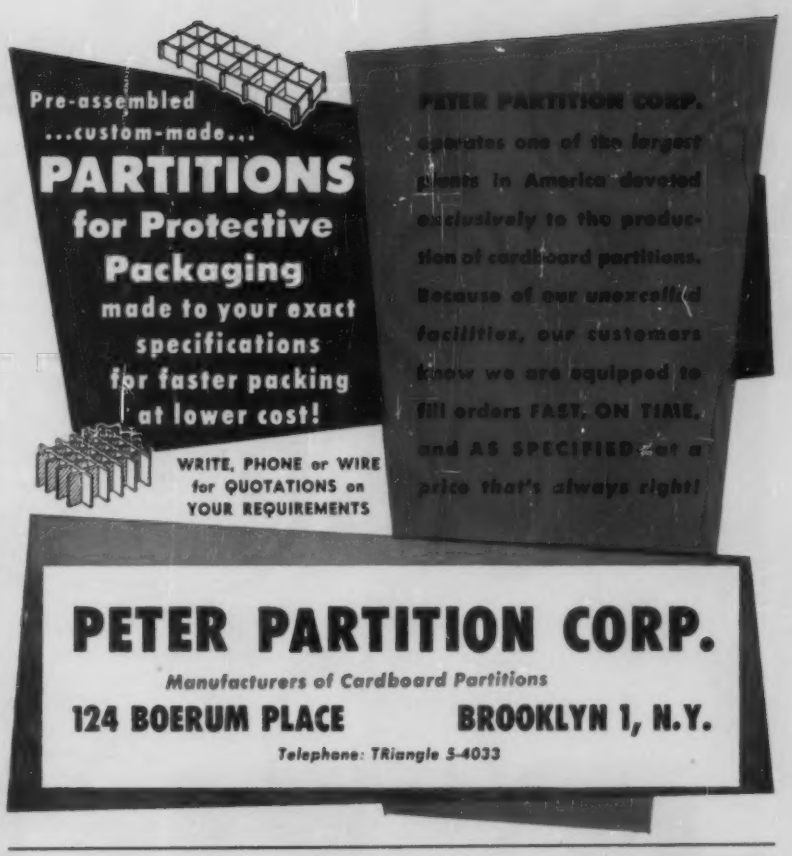
**Hydrocyanic acid.** Essential information for the safe handling and storage of hydrocyanic acid, including material on shipping containers, storage, waste disposal, medical management, and employee safety. Chemical Safety Data Sheet SD-67. Price: 30¢. 16 pages. *Manufacturing Chemists' Assn. Inc., 1625 Eye St., N. W., Washington 6, D. C.*

**Woven roving.** Description of a woven fabric produced from parallel fibrous glass, and its use in the manufacture of products ranging from tooling fixtures and inboard cruisers to swimming pools and pipes. 8 pages. *L.O.F. Glass Fibers Co., 1810 Madison Ave., Toledo 1, Ohio.*

**Tooling materials.** Physical properties, product description, applications, and characteristics of Hysol epoxy resin and hardeners, both room temperature and heat curing systems. Bulletin T-1. 4 pages. *Tooling Div., Houghton Laboratories, Inc., 106 Houghton Ave., Olean, N. Y.*

**Nylon coil bobbins.** Complete dimensions of all standard one-

(*To page* 173)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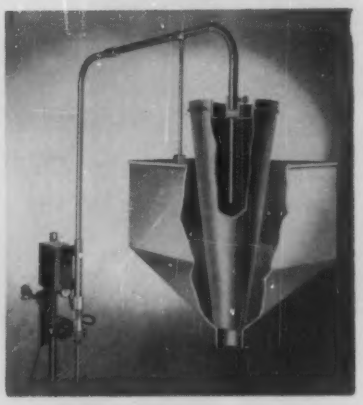

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**Whitlock Hopper Loader Attachment**

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**Handles Dusty Dry-Colored Materials**

It consists of a conical shaped filter which is attached to the end of the conveyor tube of the Whitlock Hopper Loader and extends down into the throat of the hopper. In operation, the filter cone is automatically kept filled about half full of material. As the material passes through, the upper part of the cone acts as a filter. The filter cones are replaceable at small cost.

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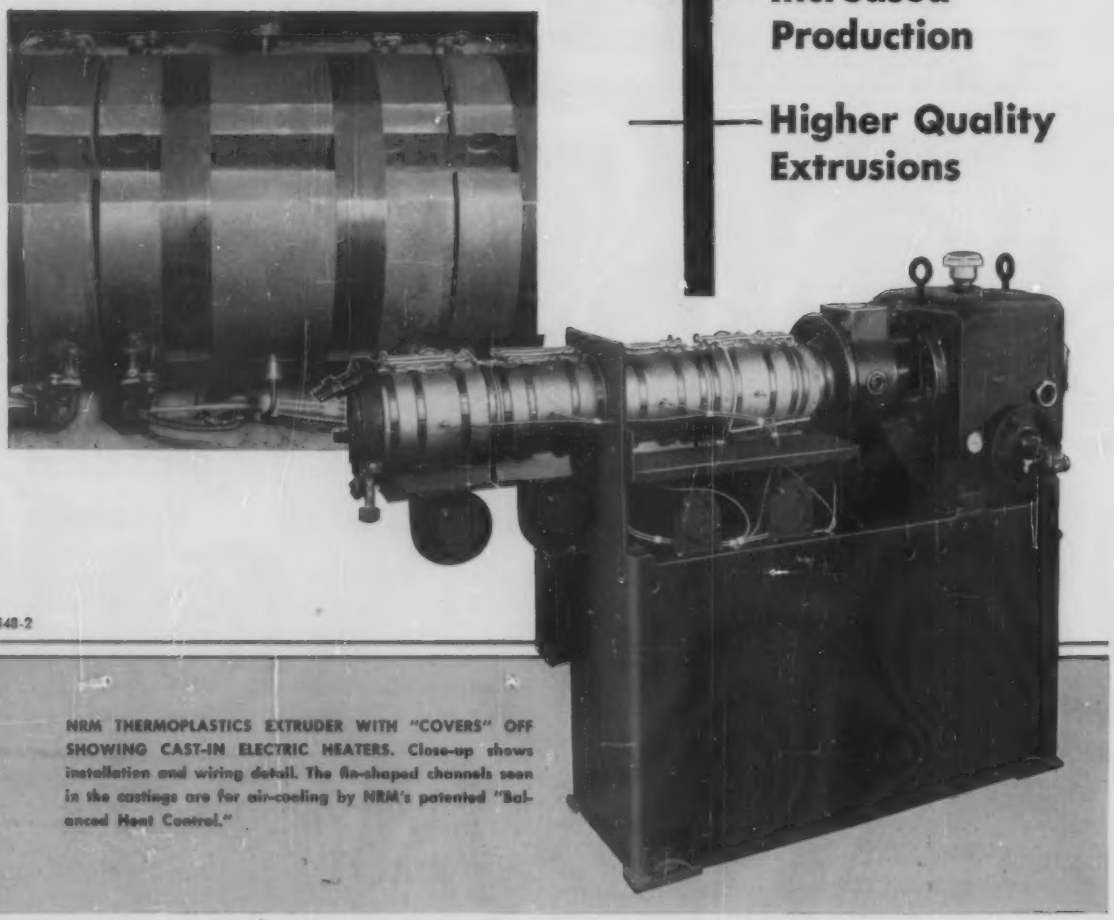
- Higher Quality Extrusions



2548-2

NRM THERMOPLASTICS EXTRUDER WITH "COVERS" OFF SHOWING CAST-IN ELECTRIC HEATERS. Close-up shows installation and wiring detail. The fin-shaped channels seen in the castings are for air-cooling by NRM's patented "Balanced Heat Control."

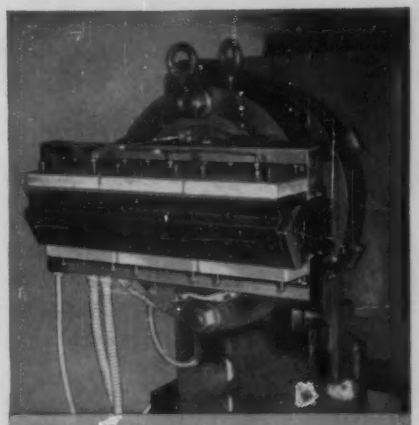
# Check these reasons why . . .

**UNIFORM HEAT TRANSMISSION**—The continuous, uniform flow of heat so vital to quality plastics production is assured by NRM's system of cast-in heating. It consists of a series of half-circle aluminum castings like the one shown in the diagram. These clamp together to "jacket" the entire length of the cylinder. Balanced spacing of heating elements, and high conductivity of the aluminum assures equal distribution of heat throughout the casting, or "shell." The constant-contact, machine-fit of shells to cylinder, plus "balanced" thermal expansion coefficients of shells and shell clamps, assure unobstructed and *uniform* heat flow from heat source to the plastic.

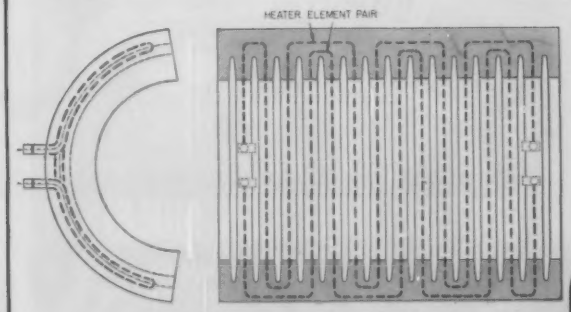
**QUICK RESPONSE TO CONTROLS** — There are no alternate "hot and cold" phases with NRM's cast-in heating. The aluminum shells store heat at controlled temperature, thus providing continuous heat to the plastic, even during the "off" cycle of the control system. Replenishment of the "stored" heat is almost instantaneous when heat input starts again.

**LONG LIFE OF HEATERS** — Burn-outs, melt-outs, or almost *any* kind of heater failure is a rarity in NRM Extruders . . . Cast-in heaters have their elements safe *inside* their bodies . . . terminals are located safely away from the heat source, and connecting wires cannot become oxidized by ambiant heat. With less "down-time" for heater repair or replacement, you get substantially more *production* time from NRM Extruders.

**PRACTICAL DESIGN** — NRM's cast-in heater system permits compact, readily accessible installations . . . easier operation . . . space saving Extruders. Products of advanced electrical and metallurgical egineering, cast-in electric heaters provide the utmost in extruder efficiency, dependability and economy. That's why they are a *standard feature* on NRM Electrically Heated Extruders in all sizes.



NRM gives you the advantages of cast-in heating on many types of dies. Shown above is a pelletizing die, and below, a crosshead. Both are more compact and efficient with cast-in heating.




TYPICAL CYLINDER CAST-IN HEATER SHELL

2548-2

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for more information on the NRM full line of Thermoplastic Extruders and Equipment. See for yourself how the many important NRM design and operating features — like cast-in heaters, for example — help make plastics extrusion more profitable.

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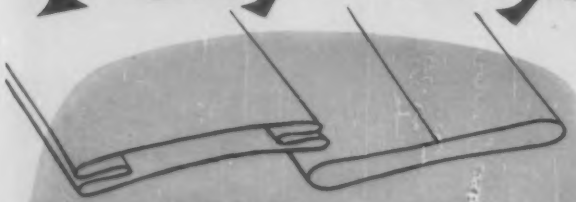

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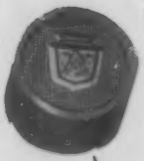

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**Adhesives, coatings, and sealers.** Recommended use, method of application, and properties of eight typical Ray-Bond adhesives, coatings, and sealers. Included is a graph which shows the various shear strengths of five thermosetting adhesives in the temperature range from 100 to 650° F. 4 pages. *Adhesives Dept., Raybestos-Manhattan, Inc., Bridgeport 2, Conn.*

**Teflon for capacitors.** Report PB 111729, "Development of Subminiature High-Temperature Capacitors," Balco Research Laboratories for Wright Air Development Center, Mar. 1955, shows how Teflon met or exceeded all requirements for replacement of mica capacitors under temperatures from —60° to 200° C. Price: $2.00. 79 pages. *Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C.*

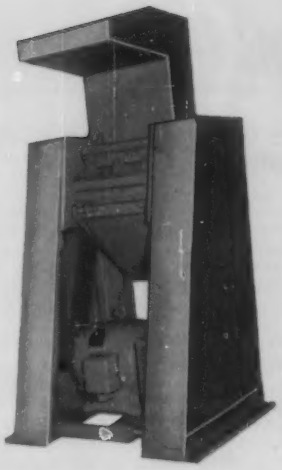
**Screw-lock inserts.** Selection tables with thread sizes, insert sizes, and complete information on drilling, tapping, gaging, and installation. Bulletin No. 738. 8 pages. *Heli-Coil Corp., Danbury, Conn.*

**Imprint attachment.** Applications ranging from placement of a small code-date on a preprinted paper wrapper to printing descriptive copy on five sides of a bundle overwrap with the Rola-printer coding and imprinting attachment for wrapping and bundling machines. Bulletin RIN-6. 4 pages. *Adolph Gottscho, Inc., Hillside 5, N. J.*

**Correction**

In the article "Double extrusion-coating," MODERN PLASTICS 34, 115 (June 1957), it was stated that Dalmine S.p.A., is a manufacturer of cast iron pipe. Lavorazione Materie Plastiche, co-developer of the coating process, has called our attention to the fact that Dalmine S.p.A. manufactures steel—not cast iron—pipe.


If you are looking for batch grinders or specials—



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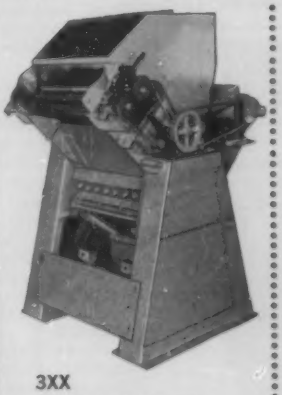

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# mp Plastics

Production and sales figures in 1000 lb.* for March and April 1957

| *Materials* | *Total p'd'n first 4 mos. of 1957‡* | *Total sales first 4 mos. of 1957‡* |
|---|---|---|
| *Cellulose plastics:*[a] | | |
| Cellulose acetate and mixed ester | | |
| Sheet, under 0.003 gage | 6,526 | 5,979 |
| Sheets, 0.003 gage and over | 5,977 | 5,531 |
| All other sheets, rods, tubes | 2,354 | 2,363 |
| Molding, extrusion materials | 30,100 | 29,370 |
| Nitrocellulose sheets, rods, tubes | 1,542 | 1,529 |
| Other cellulose plastics | 1,928 | 1,547 |
| *Phenolic and other tar-acid resins:* | | |
| Molding materials[a] | 63,749 | †9,498 |
| Bonding and adhesive resins for: | | |
| Laminating (except plywood) | 20,554 | 15,411 |
| Coated and bonded abrasives | 6,081 | 5,711 |
| Thermal insulation | 16,602 | 16,070 |
| Plywood | 15,[illegible]3 | 11,259 |
| All other bonding uses¶ | 17,256 | 16,072 |
| Protective-coating resins | 10,407 | 8,943 |
| Resins for all other uses | 13,378 | 11,814 |
| *Urea and melamine resins:* | | |
| Textile-treating resins | 13,162 | 12,812 |
| Paper-treating resins | 9,330 | 8,137 |
| Bonding and adhesive resins for: | | |
| Plywood | 31,339 | 30,111 |
| All other bonding and adhesive uses, including laminating | 9,557 | 8,925 |
| Protective-coating resins | 12,823 | 9,746 |
| Resins for all other uses, including molding | 30,869 | 30,785 |
| *Styrene resins:* | | |
| Molding materials[a] | 139,764 | 140,976 |
| Protective-coating resins | 28,945 | 26,679 |
| Resins for all other uses | 49,588 | 41,687 |
| *Vinyl resins*, total[b] | 270,199 | 256,793 |
| Polyvinyl chloride and copolymer resins (50% or more polyvinyl chloride) for: | | |
| Film (resin content) | | 32,388 |
| Sheeting (resin content) | | 19,788 |
| Molding and extrusion (resin content) | | 76,913 |
| Textile and paper treating and coating (resin content)[c] | | 21,402 |
| Flooring (resin content) | | 26,948 |
| Protective coatings (resin content) | | 12,052 |
| All other uses (resin content) | | 15,070 |
| All other vinyl resins for: | | |
| Adhesives (resin content) | | 13,462 |
| All other uses (resin content) | | 38,794 |
| *Coumarone-indene and petroleum polymer resin* | 82,520 | 82,969 |
| *Polyester resins* | 32,031 | 27,900 |
| *Polyethylene resins* | 210,574 | 202,578 |
| *Miscellaneous:* | | |
| Molding materials[a,d] | 16,498 | 16,430 |
| Protective-coating resins[e] | 4,611 | 13,092 |
| Resins for all other uses[f] | 42,475 | 40,430 |

*Dry basis designated unless otherwise specified. †Revised. ‡Partially estimated. ¶Includes friction materials. [a]Includes fillers, plasticizers, and extenders. [b]Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production

# Production

From statistics compiled by the U. S. Tariff Commission

| *March†* | | *April‡* | |
|---|---|---|---|
| *Production* | *Sales* | *Production* | *Sales* |
| 1,899 | 1,770 | 1,703 | 1,437 |
| 1,705 | 1,600 | 1,555 | 1,460 |
| 648 | 688 | 656 | 614 |
| 8,289† | 8,213† | 7,168 | 7,115 |
| 379 | 359 | 357 | 330 |
| 500 | 448 | 528 | 460 |
| 17,861 | 14,225 | 12,881 | 14,234 |
| 5,595 | 3,747 | 5,013 | 3,951 |
| 1,513 | 1,472 | 1,342 | 1,262 |
| 3,970 | 4,139 | 4,195 | 3,858 |
| 3,576 | 2,561 | 4,052 | 3,157 |
| 4,167 | 3,841 | 4,146 | 4,182 |
| 2,625 | 2,420 | 2,402 | 2,084 |
| 3,134 | 2,653 | 2,896 | 2,884 |
| 3,203 | 3,238 | 3,344 | 2,831 |
| 2,491 | 2,015 | 1,916 | 1,631 |
| 8,829 | 7,996 | 7,922 | 7,609 |
| 2,799 | 2,146 | 2,035 | 2,392 |
| 3,308 | 2,837 | 3,191 | 2,151 |
| 8,588 | 7,884 | 7,477 | 8,126 |
| 37,369 | 37,448 | 36,653 | 35,652 |
| 7,252 | 6,351 | 7,371 | 6,904 |
| 13,672 | 11,696 | 12,055 | 10,523 |
| 70,419 | 66,706† | 68,679 | 62,265 |
| | 8,589 | | 7,036 |
| | 5,272 | | 4,191 |
| | 20,123† | | 18,180 |
| | 5,440 | | 4,628 |
| | 6,879 | | 7,890 |
| | 2,798 | | 3,495 |
| | 4,173 | | 4,201 |
| | 3,372 | | 3,847 |
| | 10,060 | | 8,797 |
| 24,382 | 23,703 | 22,174 | 22,406 |
| 8,618 | 7,762 | 8,961 | 7,595 |
| 56,587 | 51,168† | 51,793 | 54,555 |
| 4,194 | 4,023 | 3,825 | 3,905 |
| 1,184 | 540 | 1,067 | 11,553 |
| 11,235 | 10,573 | 11,810 | 10,609 |

are given. †Includes data for spreader and calendering-type resins. ‡Includes data for acrylic, nylon, and other molding materials. *Includes data for epichlorohydrin, acrylic, silicone, and other protective-coating resins. †Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.


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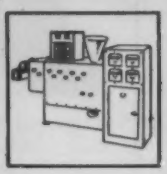

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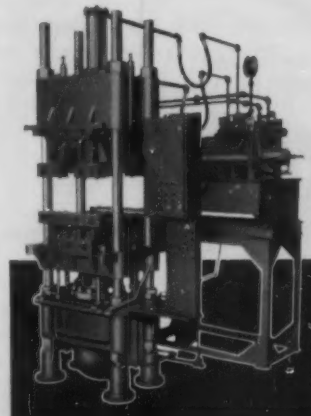

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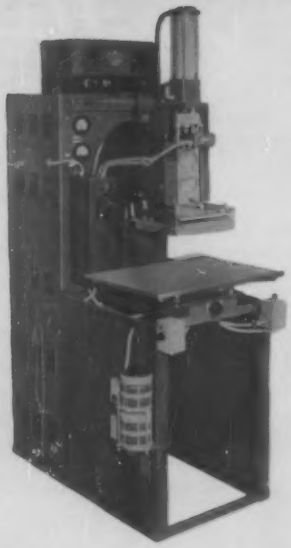

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# The Platform

Where readers may voice their opinions on any phase of or problem in the plastics industries, controversial or otherwise. The editors of MODERN PLASTICS take no responsibility for opinions expressed in letters herein.

*The following letter appeared as an item in the* Christian Science Monitor *and is republished with permission because it is germane to a serious problem—the problem of plastics distribution.*

"Every fall I try to think of something I can make in the shop to pass the cold season. Last year, it was some cold frame sash, something I could start seedlings under come spring and have an earlier garden. Now, be it known that a great modern corporation, known here as Corporation A, has recently developed an extruded plastic substitute for glass known, let us say, as Transpeek. Other similar products have been available, but this one stands up under tests, and seemed to me to be just what I needed. I wrote to Corporation A, exposing my desires, and inquiring about a sale. Voila!

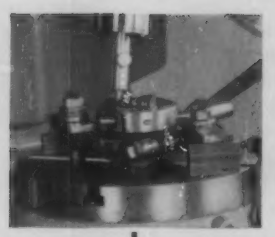
"We now step into the swift action of the stirring drama itself —obtaining a clear view of American Industry at top efficiency. Corporation A replied immediately, thanking me for my interest, assuring me of their appreciation, stating that I had certainly made a wise decision, and apologizing because they were in no position to supply me. They, it seems, merely make the stuff, and have no facilities for forwarding it to the consumer. They suggested I write to Corporation B, which has just been appointed distributor for the building trades, and Corporation C, which is similarly appointed for the horticultural and agricultural aspects. Thanking me again, they remain mine truly . . .

"Inclosed was 'Literature' about their product, which was duplicated at once by Corporation B. Corporation B, however, neglected to send me any Transpeek or tell me where I could get it. Corporation C proved more helpful. They telephoned me from their general offices in New York, affably welcoming me, and explaining that as yet they had not been able to arrange for retail outlets in my vicinity, and so would have to deal with me directly. The man sounded as if he expected me to place an order for ten carloads a month. 'This thing is out of hand,' I said. 'I want all of a hundred sq. ft. or so.' This didn't calm him down a bit. He said that didn't matter, they had to start somewhere. Personally, he didn't even know what Transpeek looks like, but in a day or so he hoped to have his loose ends in hand.

"Next appears Corporation D, wholesale outlet for New England. They telephoned to explain that retail outlets were not yet established, so they would favor me with wholesale privileges, C.O.D. Long ago I notified all local carrier agents that they could automatically return any C.O.D. shipments coming my way, without bothering to ask me, so I told the man how things stood and he said, 'Well, then you can establish credit and we'll ship on open account.'

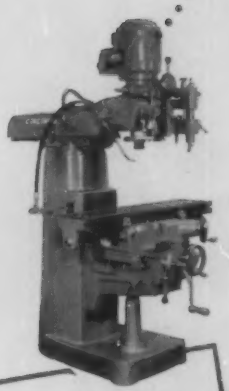
"This brings in Corporations E, F, and G, who are bilateral participants and figure only as cross-references. I mentioned General Motors, U. S. Steel, and the Pennsylvania Railroad, three reputable corporations with which I have, off and on, done business one way or another, and these proved acceptable enough so I shortly received, hooray-hooray, a roll of Transpeek.

"We now return to Corporation



CINCINNATI

# Small Details Never Escape the Contourmaster



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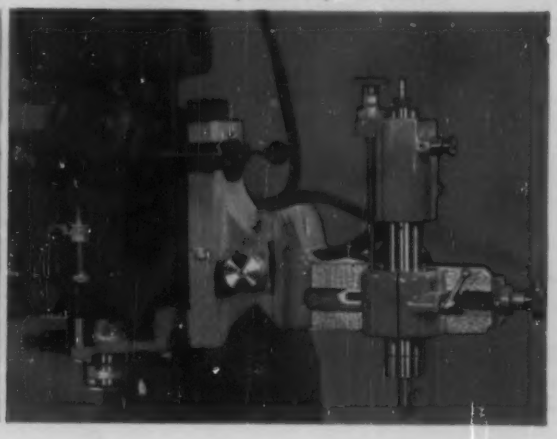

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A, which has put on the market a new product of certain chemical properties unknown to me, and I am about to attach it to wooden frames which I have made. I desire to know about an adhesive for bonding it to the wood. My letter to Corporation A brings a quick reply, stating that experiments have not gone far enough so they can give me a final answer, but thus far they feel butyl acetate, ethyl acetate, styrene, or any similar product will give good results. These are, they add, available from Corporations H, I, J, K, L, and M.

"I will not run through all the ramifications of ensuing correspondence with Corporations H, I, J, L, and M, but I will report that with Corporation K. Corporation K thanked me for writing, and pointed out that, they, too, make a plastic glass-substitute which is excellent for cold frames, and are taking the liberty of inclosing literature on it. As to an adhesive, they feel something like methyl methacrylate polymer might work, but they do not make this themselves, and suggest I make contact with Corporation N. If, however, I feel methyl dicrocuspid polyplatus cresylite would work better, I should inquire of Corporation O, adhesives division.

"Thus it went, as I, poor thing, long since lost my way in the maze. American Business and American Know-how, methacrylated into a working unit, is too much for a poor country lad. I felt like sobbing, 'Look, all I wanted was a few frames for cucumbers!' But the thing rolled on. Corporation O has sent me samples, and upon deciding which works best I can order in quantities.

"The cold frames are all made. I finished them. Total cost to me has been $38.62, including the plain old carpenter's glue I finally used. I estimate, conservatively, that American Industry has spent at least $1000 answering my questions, experimenting, and paying for phone calls—as well as supplying me samples. Nobody around here knows an acetate from an ethyl, and we're very impressed with American Industry."

*John Gould,*
Lisbon Falls, Me.

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Capitalize on these advantages of ATLAC Thermaflow nylon or glass reinforced materials in your parts designs:

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## Formable flocked styrene sheet

**A** new thermoformable sheet material destined for the packaging, furniture, display, and other fields has been announced by The Gilman Bros. Co., Gilman, Conn. Called "Stylour," this is a super-high-impact styrene sheet flocked on one side, equal to velour in touch and appearance. Flocking may be either cotton or rayon at present, but experimental work is being done on the use of other synthetic flockings.

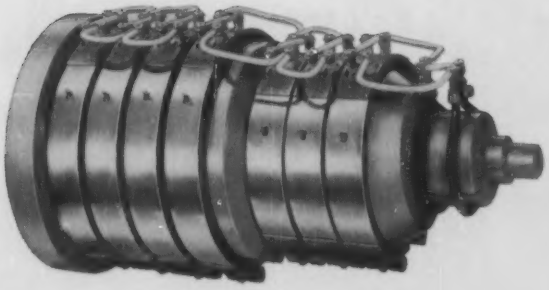
This development represents a major break-through in the economical production of platform or tray-type luxury packages. Previous to this time flocking had to be sprayed or applied through an electrostatic field on to each piece after it had been formed and it was difficult to apply flocking evenly to the desired shape. A two-year research and development program by Nashua Corp., Nashua, N. H., and Gilman Bros. has resulted in a process of continuous flocking styrene alloy sheet material so effectively that deep draws can be made on the same cycles as are employed for unflocked material.

The Stylour sheets come in gages from 0.010 to 0.125 in. and on the standard yard, 26 by 36 in., minimum run prices of 1000 yards range from $.80/yd. unit in the thinnest gage to $4.59 in the ⅛-in. stock.

This new flocked sheet brings the Gilman line of sheet types up to five. A new version combines the Stylour material with embossed material to provide a sheet that can be formed into a complete finished package, with flock on the inside and grain on the outside, in one vacuum or drape forming operation.

Other applications suggested for the new flocked sheet include tote boxes, toys, interior automobile body and train trim, and wall coverings.

**Three materials** in the Gilman line are (left, above), textured high-impact sheet in all colors; (left), new Stylour flocked sheet; and (above) decorated sheet in wood grains, flitters, etc.



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You can convert your present machines in a matter of seconds. All standard sizes stocked for immediate shipment; other diameters available to order.

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Bulletin SP-2508 gives sizes, dimensions, prices.

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ACTUAL SIZE ACTUAL SIZE

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Tooling, set-up and first 100 pieces, including material and trimming ..... **$286.00**

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## Atmosphere control

**U**se of acrylic instead of stainless steel in the fabrication of atmosphere control boxes has enabled a Long Island, N.Y., manufacturer to reduce his costs by two-thirds.

The controlled-atmosphere box, a low-cost alternative to the sealed room, is receiving wide application in industrial and laboratory work. Conventionally, these boxes are of stainless steel with a removable glass panel in front.

The acrylic atmosphere box was developed by Controlled Atmosphere Enclosures Corp., Springfield Gardens, Long Island, N.Y. It has two basic components—the main enclosure, or hood, and an air lock. The hood is produced from cast acrylic sheet in a combination vacuum forming and matched mold process. Sheet gage ranges from ⅜ to 1 in., depending upon requirements of the box. The hood is rendered airtight by means of a continuous length of vinyl tubing, inflated to 20 lb. pressure, that fits between the hood and the detachable front plate, which is made of ¼-in. acrylic sheet.

The air lock permits safe transfer of material into and out of the box without changing the environment. The device is made of a length of cast acrylic tubing which has been re-formed into a square shape. The flat sides make the transfer of work specimens more convenient. This fabrication idea won a prize in the recent design contest sponsored by Cadillac Plastics and Chemical Co.

*Credits:* Acrylic sheet manufactured by Rohm & Haas Co., Philadelphia, Pa. Cast acrylic tube produced by Cadillac Plastic and Chemical Co., Detroit, Mich.

**Low-cost** atmosphere control box is fabricated of cast acrylic sheet and tubing

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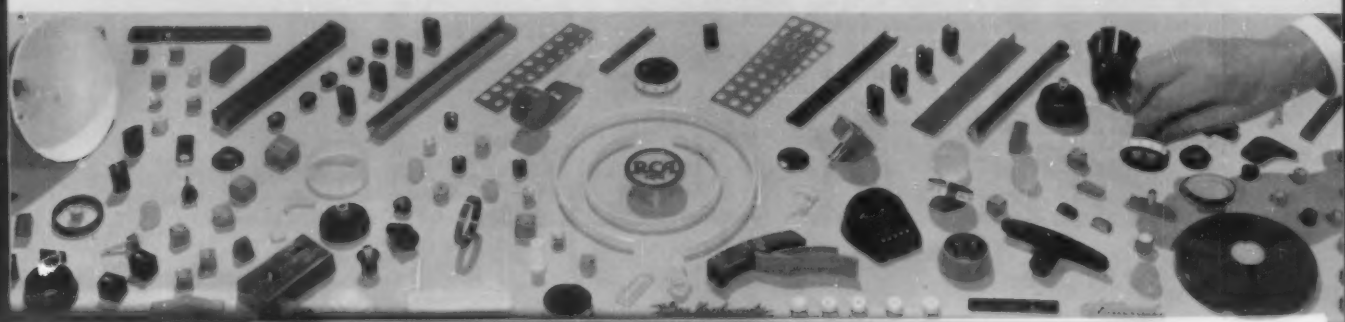

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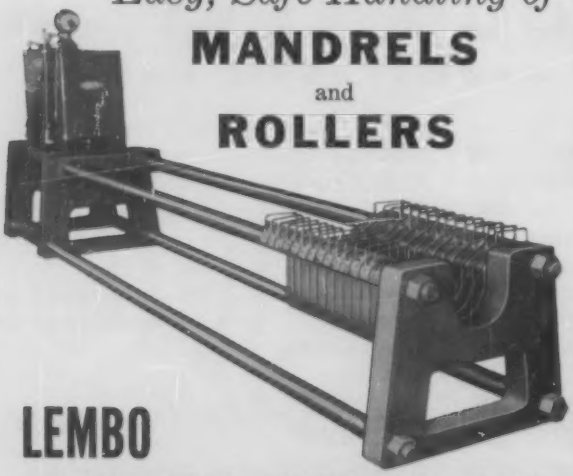

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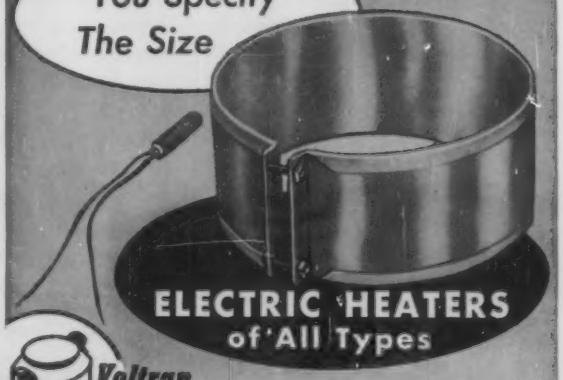

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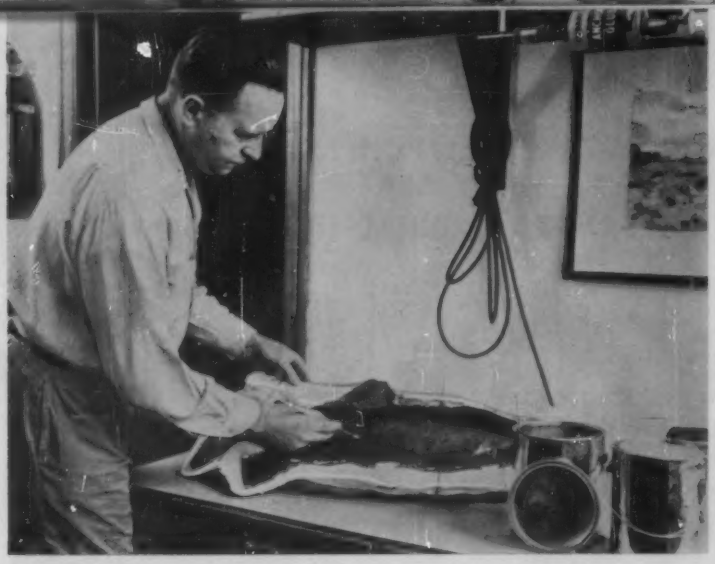

**In preparing reproduction** of trout, epoxy resins are brushed into a plaster cast of the fish to obtain realistic model

## Fish reproduced in epoxy

**A** new technique for making life-like models of fish for museum display produces excellent results and is said to simplify previous casting methods and cut reproduction time by as much as 60%. The process, which uses an epoxy resin-base casting compound, was developed by Herman Hinrichs, preparator at Grand Rapids, Mich., Public Museum. In the photos, Mr. Hinrichs demonstrates the new casting technique to make a model of a record 19-lb., 4-oz. trout.

Display models of epoxy resin are highly durable and withstand constant handling. They are also impervious to moisture penetration and resist attack by chemicals, oils, and greases.

In preparation, the fish is first eviscerated, carefully posed, and the body cavity filled with corn meal. Then the specimen is covered with a heavy plaster cast. After hardening, the cast is lifted and liquid epoxy resins are brushed into the cavity (top photo). Several layers of glass cloth bonded with the resin are used to reinforce the inside of the cavity. Epoxy compounds have excellent bonding characteristics and cure quickly at room temperatures without the need of baking ovens or pressure. They are dimensionally stable and retain the smallest detail throughout the life of the model.

After the casting compound cures, the plaster cast is removed and the ragged edges of the epoxy model are trimmed with hand tools. The fins of the fish are cast separately by the same process and attached to the body shell. An electric drill is used to make an opening for a glass eye.

When the specimen has been mounted against a realistic background, oil paints are used to put in the final life-like colors of the trout for display. Because of the close reproduction of body details, the finished model has a life-like appearance and is entirely authentic.

*Credits:* Epoxy resin-base casting manufactured by the Haskelite Mfg. Corp., Grand Rapids, Mich., from resins supplied by Bakelite Co., New York, N.Y.

**Natural colors are** produced with oil paints in final touch-up process


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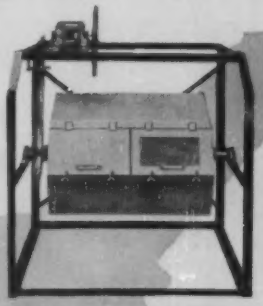

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This means that the mold is made with complete accuracy right to the smallest detail, and reproducing the features that win the approval of the most critical eye.

The castings from molds made in our toolroom prove we have matched the pace set by your engineers. They please because they are perfect molds, as perfect as modern skills in a progressive organization can make them.

*The phone at your elbow*
*is our farthest distance from you.*

**RICHARD O. SCHULZ CO.**
ELMWOOD PARK ILLINOIS
DIECASTING DIES
PLASTIC INJECTION AND COMPRESSION MOLDS

## Quick curbing cemented with epoxy adhesive

The present national highway program covers some 41,000 miles of interstate superhighways, 200,000 miles of state highways, and 508,000 miles of rural roads. Many thousands of miles of curbing will be required, in both new construction and reconstruction throughout the country.

Under current conventional methods of making curbs, forms have to be built, concrete poured and allowed to set, and the forms removed—all time-consuming operations. In a new method of installing curbs, a relatively dry mix of concrete is extruded to shape right on the line of the pavement where it is to remain—and cemented in place with a plastic adhesive. The concrete mix, formulated to have non-slumping characteristics, is to run directly from a transit-mix truck to the hopper of the curb machine.

The curbing is laid down at a rate of approximately 350 feet per hour. One problem encountered in this process results from the fact that new concrete, especially the non-slumping, low-moisture type such as is required, does not adhere well to either concrete or plant-mix asphaltic pavements. It is therefore necessary to use an adhesive between the curbing and the pavement.

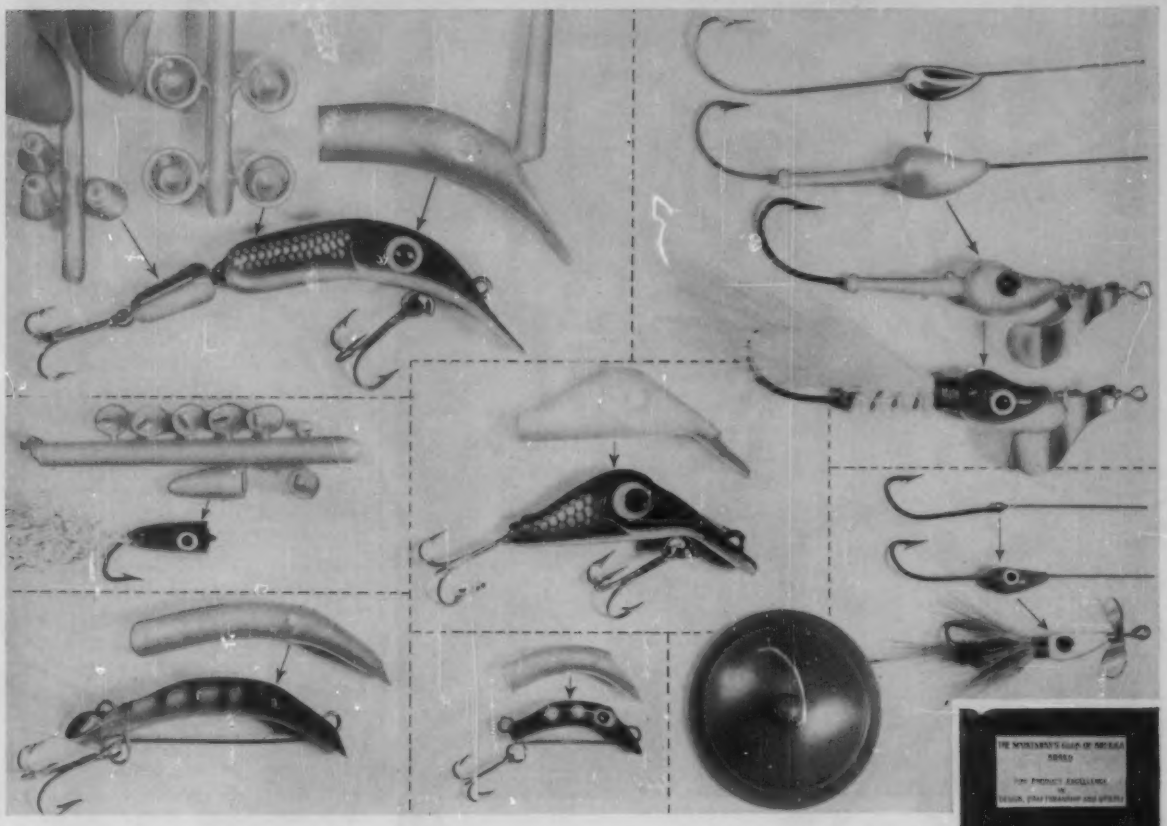
Either asphalt or polyvinyl acetate adhesives are sometimes used for such bonding processes, but both have relatively poor moisture and aging resistance, and cannot withstand the high stresses imposed by the impacts of heavy vehicles hitting the curbing.

Because of these shortcomings, an adhesive was needed that would solve the problems. As a result, Aerobond brush-on-concrete adhesive was developed for the purpose. This is a two-package epoxy system of low viscosity, consisting of 100% solids. It is provided in small, pre-weighed packages which are combined at the time of use, and applied by brush to the pavement immediately ahead of the extrusion machine. The mixed material has a pot-life of about 20 min., and is fully cured by the time the concrete itself hardens.

Experience has shown that a coverage of approximately 600 lineal feet per gallon of adhesive is obtained, resulting in an adhesive material cost of approximately $.05 per lineal foot of curbing. This estimate is less, by far, than the cost of material for forms for the more conventional type of construction. In service tests, it has been found that trucks and other heavy equipment can be driven against, or even over the curbing, without breaking the bond with the underlying pavement, whether it is concrete or plant mix.

*Credits:* Aerobond epoxy adhesive developed by Adhesive Engineering, San Carlos, Calif. Information on concrete extrusion machine supplied by Paul Sidrer, of Curbco.

# "Fishing" for Better Quality, Bigger Profits?



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## Here's how OSTER* does it on a MINI-JECTOR®

**You may not make baits, but *your* products will be *better*, and cost you *less* by these *new methods!***

**MODEL 55 air-JET "Wasp."** New, electro-air MINI-JECTOR is push-button controlled. Increases machine output, reduces operator fatigue.

"We save *thousands* in tooling," says Ed Oster, President of *OSTER BAIT & TACKLE MFG., Cleveland. He designs and produces fishing lures (above)—using a MINI-JECTOR "Wasp" for all molded plastic "bodies" and components. Material: Eastman's Tenite Butyrate. Oster introduces new designs often. He completes molds quickly for his MINI-JECTOR (blanks as low as $29.50), runs off thousands of perfect parts; assembles, finishes, packages, and markets his products *before* complicated "big press" tooling gets off the "board." His MINI-JECTOR meets market demand year after year with hundreds of thousands of perfect baits. Some are so complex (tiny holes, slots, hollow bodies, etc., all one-operation molded) that *only* MINI-JECTOR can produce them. Others are encapsulated (plastic molded over wires, hook-eyes, spines, etc.), easy for his MINI-JECTOR "Wasp" with its simple mold ejection principle. Oster runs 4 or 5 different colors a day—no lost time. He credits MINI-JECTOR for making his products *"many times better at a fraction of former costs."* If *you* develop and produce varieties of small (1/3 oz. to 1 oz.) plastic injection molded items, MINI-JECTOR is your answer. Molds all thermoplastics, including Nylon. Pays for itself in savings *alone*.

**Write for Catalog Today!** Complete, detailed, fully illustrated. Shows entire line of MINI-JECTOR Plastic Injection Molding Machines and accessories. Tells how MINI-JECTOR can add new flexibility, efficiency and economy to development and production of your 1/3 oz. to 1 oz. plastic injection molded items.

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SEILON is available in many types, gauges, and finishes. One may be exactly what you are looking for — or, if your need is for special properties, we will be happy to work with you in developing a SEILON tailored to your exact requirements. Your inquiry will be welcome. Please write or phone.

Plastics Division

SEIBERLING RUBBER COMPANY

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## Ice cream in polyethylene

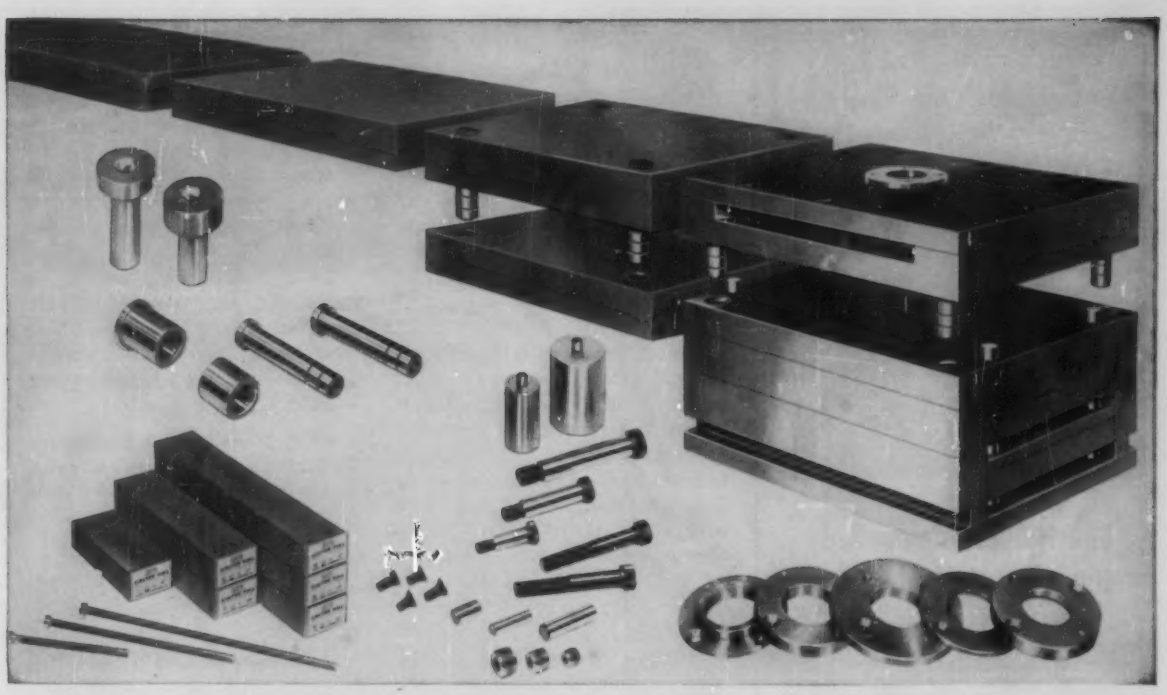
**A** Minnesota dairy is saving 0.6¢ a gallon by shipping liquid ice cream mix in heat-sealed polyethylene film bags instead of conventional milk cans. The bags are encased in corrugated cartons. The new packaging method reportedly enables Rochester Dairy Cooperative to dispense with washing and inspecting cans, doubles the efficiency of filling and loading, and cuts truck loading time from 1¾ hr. to 45 minutes. The weight saving reduces handling problems and also permits transporting 2450 gal. per truck instead of 2000 gal. in cans.

In addition, the containers increase consumer acceptance since they are easier to handle at the retail end than filled milk cans, which weigh up to 120 pounds. This is particularly important to individual frozen milk stands, where the employees are usually women, girls, or young students.

The insulating qualities of the new package have also proven satisfactory. In one test, a shipment of ice cream mix loaded at 34° F. traveled for 27 hrs. and increased only 3° in temperature.

*Credits:* Polyethylene bags fabricated by Winzen Research Inc., Minneapolis, Minn., of film supplied by Visking Corp., Chicago, Ill.

**Heat-sealed** polyethylene bag, inside corrugated carton, is used in shipping liquid ice cream mix. (Photo, Bakelite)



# PROGRESS THROUGH STANDARDS

## . . . and how DME "helped"

The history of economy in modern business has been directly related to the history of Standardization. One of the major elements affecting the economic production of finished plastic parts is the high initial cost of the mold. A progressive step in reducing mold cost, without sacrificing the high quality required, has been successfully achieved through Standardization.

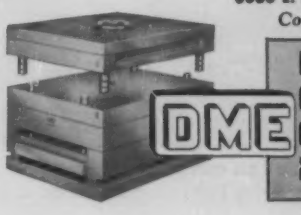
When D-M-E originated Standard Mold Bases and their component parts in 1942, it provided the answer to the rapidly growing demand for high quality molds that would maintain and promote the economic advantages of plastic parts.

Through large volume purchases of quality steel in standard sizes and specialized production facilities, D-M-E was able to produce and supply high quality Standard Mold Bases to mold makers and molders at such great savings in cost and time that the benefits of Standardization were quickly realized by the Industry.

Today D-M-E produces twenty-two different sizes of Standard Mold Bases, from 9" x 8" to 18" x 35½", in either D-M-E No. 1 or No. 2 Steel, with a wide range of cavity plate thicknesses to satisfy the diversified demands required. In addition, over 2,000 finished component parts of the same high quality are available to provide additional savings in service as well as in the product.

Properly engineered Standardization puts the accent on Economy. When you "Specify D-M-E . . ." you get Quality, Service AND Economy!

*Specify* **D-M-E**
*for*
**QUALITY . . .**
**SERVICE . . .**
**ECONOMY!**

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**is best and most effective because...** it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always.

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*District Engineers in Principal Cities of U. S. and Canada*

## Interlocking electrical outlet strips

Easy-to-install, absolutely safe, inconspicuous, and low-cost electrical outlets where they're needed—that sums up the new Snapit Inter-Link multiple electric outlet system. Starting from any wall outlet, even the most helpless housewife can add additional outlets in minutes—and a small screwdriver is the only tool required.

The system is comprised of interlocking foot-long units molded of ivory urea plastic. Available in five different types, including links with outlets, links without outlets, and a flexible strip to fit around corners and pipes and over doors, the units are interchangeable and provide for vertical or horizontal installation in home, office, workshop, or store. So the days of the unsightly and potentially dangerous tangle of cord stemming from a single outlet are numbered. Because each length has two No. 12 conductors, rated 15 amp. at 125 v., up to six small appliances such as lamps, toasters, shavers, and radios can be plugged in safely to a system stemming from a single built-in wall receptacle.

This newest member of the Snapit family of ivory-colored wiring devices is approved by Underwriters' Laboratories, Inc., a sure guarantee of quality and safety, as are its companion cord sets, switches, plugs, night lights, and specialty devices. The rigid urea plastic is strong, resists scratching and discoloring, and its rich ivory color harmonizes with any wall decor. The units may be painted to match the wall or molding if desired.

Each link, factory tested, is supplied to the user with simple installation instructions and two mounting screws especially made for insertion in plaster but equally effective in wood.

*Credits:* Molded and manufactured by Cable Electric Prods., Providence, R.I., using American Cyanamid Co's. Beetle urea.

**Each link** of outlet strip is easily fastened in position with two screws

**First link of an outlet** strip installation plugs into a base-board outlet; successive links plug into ends of each other

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ELECTRONIC HEAT SEALERS

YEARS AHEAD in

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EXCLUSIVE:

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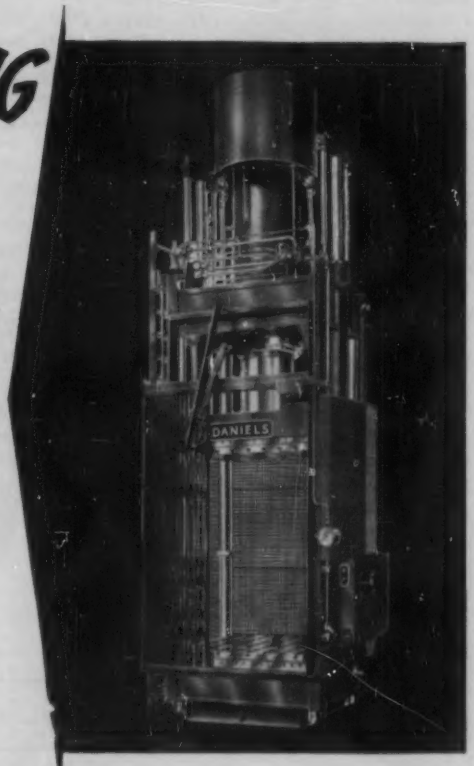
POLYESTER MOULDING

with this

100 TON LOW PRESSURE PRESS

This is the first Press designed and produced in Great Britain for moulding reinforced Plastics materials. It is much larger than the conventional compression moulding press, having tables 4 ft. x 3 ft., a maximum daylight of 7 ft. and a 4 ft. stroke. To prevent heat from the moulds affecting the press, both the fixed and moving tables are drilled for cooling water. Hydraulic working pressure is 1000 lbs. per sq. in., giving a maximum moulding pressure of 100 tons, but the moulding pressure may be set at any figure between 10 and 100 tons. A slowing device is incorporated which can be set to operate at any portion of the stroke allowing for very slow final closing on the moulded article. The press is a self-contained unit with single stage vane-type pump, 12½ h.p. motor, hydraulic piping and valves.

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## Greater rigidity and less heat distortion in new coil forms molded from NYLATRON® GS

These coil forms are another convincing example of product improvements that are possible with Nylatron GS nylon molding powders. Coil forms molded of Nylatron GS now possess greater rigidity and higher heat distortion temperatures. Molders report less warpage with better tolerance control. The increasing use of Nylatron GS for important parts and components is proving the value of outstanding characteristics like these:

**Exceptional Dimensional Stability**—Low coefficient of linear expansion and minimum distortion after molding, provides accurate, close tolerance molding.

**Low Surface Friction**—When wear parts must run dry, Nylatron GS parts can operate without lubrication.

**High Wear and Abrasion Resistance**—Part surfaces resist abrasion and demonstrate long wear in contact with metals.

**High Heat Distortion Temperature**—Nylatron GS parts provide higher heat distortion temperatures than standard nylon 101.

**Greater Rigidity**—Parts have higher modulus of elasticity, show less deformation under load than nylon 101.

**Excellent Insulating Properties**—Low dielectric constant and relatively high dielectric strength.

NYLATRON GS nylon molding powder is a molybdenum disulphide filled nylon* developed to expand the field for nylon parts. Latest technical data or guidance in using Nylatron GS is readily available in answer to your request.

**NATIONAL POLYMER PRODUCTS, INC.**

A Subsidiary of The Polymer Corporation, Reading, Pennsylvania

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*PATENTS APPLIED FOR

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☐ Please send me bulletin on NYLATRON GS nylon molding powders

☐ I have this use in mind: _____

_____

Name _____ Position _____

Company _____

Address _____

City _____ Zone _____ State _____


## No minimum size

(*From pp.* 93-95)

thousandth of an inch. It is recommended that any lettering on a part be raised above a surface or limited to a recessed panel; depressed lettering also means higher tooling costs. A minimum wall thickness of 0.008 in., and core diameter of 0.015 in. can be obtained.

### Manufacturing economy

Since Gries offers both metal and plastic parts, it is in an unusual position regarding material choice. It recommends plastic for a given application only when it will do a job that metal will not do.

The use of a plastic part, for instance, very often is a factor in the production of manufacturing economies because one part will do the work of two or more metal parts, allowing considerable savings on both part cost and assembly.

A typical example is an electrical snap switch molded for the Square D Co., where a nylon button and stem, molded in one piece, was able to replace a two-part assembly.

Cost of the plastic part was 60% less than the former pieces, and the user reported he reaped dividends in more accurate trip characteristics and a good deal longer service life.

### Nylon eliminates insulator

A similar instance involved a ratchet for a pull-chain socket. Again, one nylon part replaced two—a copper ratchet and a fiber insulator; the insulator was eliminated because of nylon's dielectric properties.

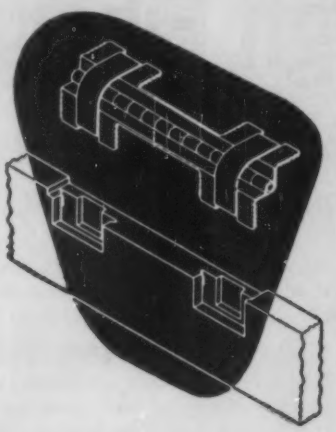
In addition to its extensive custom operations, Gries maintains a sizable number of standard parts in stock, including coil bobbins, bushings, gears and pinions, and various insulators and fastening devices.

Like any other business, the miniature parts field is not without pitfalls.

Once, not too long ago, when the company had a big run of one of its tiniest parts, an employee sneezed and a full day's production was lost!—END

# HINGES...
## for PLASTIC BOXES

press-fit assembly
(Holds like
a drive-screw)
with
or without
double action
"C" Springs



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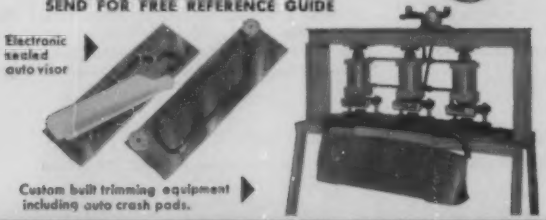


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what's
this

# "thingamaJig?"

We don't know what it is—but it's molded of polyethylene, so Interplastics must have had a hand in it.

What's *your* next "thingamajig"? If it's molded of polyethylene, chances are Interplastics can save you money with carefully processed polyethylene, natural or colored. Sometimes we have attractive spot lots of virgin polyethylene, too.

But that's not all—Interplastics also deals in polystyrene, nylon, acrylics, vinyl and cellulosics. And —if you have scrap or surplus materials for disposal, we would like to buy it.

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# "We get the most consistent with Pittsburgh Fiber Glass

*. . . says Mr. Forrest Engelhart, President, Automatic Plastic Molding Company, Berkeley, California*

"Plastic products reinforced with fiber glass account for 50% of our business," reports Mr. Engelhart. "Our major product is safety helmets, but we also produce file drawers, film developer trays, kindergarten chairs and battery cases.

"Here's how our production improved when we switched to Pittsburgh Fiber Glass Roving as a reinforcing agent:

**1. IMPROVEMENT OVER FORMERLY USED MATERIAL**

"The reinforcing material we previously used was not Fiber Glass and could not pass the water absorption test, would deteriorate with age and weather, and we could get only one color with it. Pittsburgh Fiber Glass Roving eliminated these inadequacies.

**2. UNIFORMITY CUTS REJECTS**

"We used Pittsburgh Type 500 and Type 508 Fiber Glass Roving with chrome finish. We must obtain a critical mixture to assure product strength. We find Pittsburgh Roving to be the most consistent in uniformity, and rejects have been reduced to less than 2%.

**3. HELMETS MEET NAVY SPECIFICATIONS**

"As a result of this consistent uniformity and the superiority of fiber glass roving characteristics, our safety helmets meet the Navy's strict specifications. These include passing a 40 foot-pound impact test, water absorption test, dielectric test and penetration test."

**PITTSBURGH ROVING CAN HELP YOU, TOO**

If you haven't used Pittsburgh Fiber Glass Roving in your molding or laminating operations, give it a try. We will be glad to arrange tests right in your plant by our technical staff. Contact our executive offices or one of the district sales offices listed below. *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.*

Screen with three helmet forms is removed from pre-form machine. Two-inch Pittsburgh Fiber Glass Roving is forced on screens by suction. About 800 pre-forms are produced per man each 8-hour day.

Liquid resin is poured over pre-form. Helmets contain 50% resin, 50% fiber glass. Molding period for these helmets takes two and one-half minutes.

Helmets are weighed and inspected before shipping. Weight specifications must be within one ounce tolerance. Helmets meet strict Navy specifications, thanks to Pittsburgh Fiber Glass Roving.

**PITTSBURGH FIBER GLASS ROVING IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY**

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PITTSBURGH PLATE GLASS COMPANY

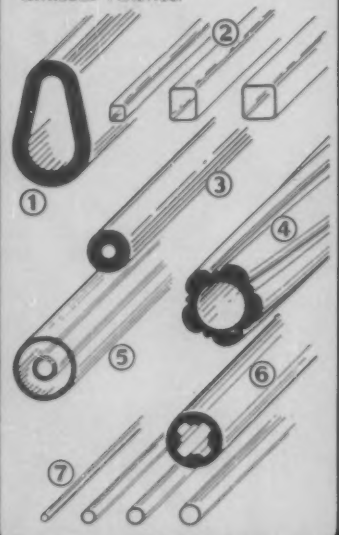
# quality Roving"

Automatic Plastic President Forrest Engelhart displays finished helmet. Pittsburgh Roving's uniformity has reduced rejects to below 2%.

ANCHOR PLASTICS EXTRUSION NEWS

TUBULAR SHAPES

Several interesting applications of hollow extruded sections are: 1) Radio Handle; 2) Relay Coil Core Form; 3) Battery Vent; 4) Electric Candle; 5) Air operated Water Pump; 6) Mechanically operated revolving Core; 7) Miniature Bore Precision Tubing. You can get ideas about applications for extruded parts by reading our brochure EXTRUDED PLASTICS.




We extrude to YOUR specifications any SHAPE, ROD, TUBE or MOULDING; also CURVED EXTRUSIONS*, FABRICATED EXTRUDED PARTS, in any of 12 plastic materials.

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ANCHOR PLASTICS CO., INC.
36-36 36th Street
Long Island City 6, N. Y.

## New product needed

(*From pp. 96-97*)

which has a heat distortion temperature approximately 20° F. higher than that of a widely used, high-impact styrene material produced by the same supplier, is particularly suitable where elevated temperatures, such as those involved in the operation of an automatic washer, are involved. In addition, the material has an extremely low water absorption rate, can be readily molded on standard injection molding equipment and is well suited to applications calling for high gloss and fine surface texture. It also has the dimensional stability and chemical resistance normally associated with styrene formulations.

### Slots molded integrally

Components for the Norge dispenser wheel are produced in a two-cavity mold on a 20-oz. injection machine. The slots in the lower section are molded integrally and require no subsequent finishing operations. Other features produced in molding include three tapered lugs which grip a rubber collar for mounting the wheel to the top of the agitator and the Norge emblem and words "Norge Dispenser Wheel" molded in relief on the central portion of the unit.

To complete the dispenser, it is necessary only to assemble the top and bottom sections of the unit, using a solvent type cement, and insert the rubber collar in the cavity on the lower side. Supplied with each dispenser wheel is a molded phenolic agitator lock-nut having an internally threaded insert which screws onto the top of the agitator shaft. To mount the dispenser wheel, the unit is merely pressed firmly into position over this disk-like lock nut, so that internal studs on the rubber collar snap into position over it. The unit is normally left in operating position at all times, but may be easily lifted off the top of the agitator if necessary.

*Credits:* Norge dispenser wheel is molded and assembled by Modern Plastics Corp., Benton Harbor, Mich., and Neo Products Co., Chicago, Ill.

Rigid plastic sheeting for every purpose

Stock sizes up to 51" x 108"

Available transparent, translucent, or opaque — in a wide range of colors.

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The Tupper Engineering Department has developed the greatest number of patents in the industry for polyethylene seals, closures, and dispensers—and other items in other plastics. This know-how can be tapped by you to place your plastic products in a position of leadership.

Tupper seals and other Tupper products are protected against unauthorized manufacture by about 150 U. S. and foreign patents and patents applied for, plus numerous trademarks and copyrights.

TUPPER! Trade-mark

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no edge chipping or cracking...

Material being cut—Triple X P-36 phenolic plastic, copper laminated, ⅛" thick. Width of cut or kerf is only .064. Compare with your present cut.

With RADIAL CUTTER New THIN-KERF* Fine Pitch Blades

These new carbide-tipped circular saw blades have been carefully developed to cut smoothly and precisely without edge chipping or cracking . . . eliminate sanding and other finishing operations . . . reduce your material waste by 20% or more. Designed specifically for applications in thermosetting and thermoplastic materials, printed circuitry, expensive woods and veneered plywoods and light gage non-ferrous metals, Radial Cutter THIN-KERF blades are ideal for hand-feed, precision cutting operations and, under certain conditions, for power feed single or gang-cutting operations. Write today for prices and specifications.

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## Molded grid

(*From pp.* 100–102)

across the bundles. (A similar commercial packing made of corrugated plastic sheeting, Dowpac HCS, partially solves this by incorporating a few horizontal channels in the vertical corrugations.)

An essential element in the development of Poly-Grid was the discovery that short tubes, down to an inch or two long, could be separated by limited vertical air spacings for horizontal distribution of air and water, without appreciably decreasing the water-to-air contact efficiency. This meant an immediate saving in weight and material, and led to the development of the flat, 2-in. grids now used.

The first Poly-Grids were fabricated from sheet stock. It was soon discovered, however, that drops from one grid too often fell freely through the cells in the grids below. To correct this, ⅜ in. "splash strips" were added along the top of each rib. The splash strips added rigidity to the structure, but ended the commercial possibility of fabricating the grids from sheet stock. The interest shifted to injection molded thermoplastics.

### Four-pound shot

It took repeated experiments for GATX to perfect the complex steel injection mold now used to produce Poly-Grid in the company's battery of 300-oz. injection machines. The problem, of course, was to get uniform distribution of the plastic along the 36 interconnecting ribs. Another problem was to get a high-density polyethylene that would flow evenly in the mold. Most cooling towers can use the less expensive polystyrene grids, but if the cooling water is contaminated by hydrocarbons, as in refineries, for example, polyethylene must be used.

Two-inch spacing between grids is accomplished by five supports which in effect are inverted cells. These are tapered so that the grids may be nested in shipment. During installation, the grids are rotated 90° so that the spacers are no longer in line. This rotation also serves to off-set the ribs in successive grids.

### Replacement market

In addition to the use of the plastic grids in many of its new industrial and air conditioning towers, Fluor sees another market for them as a replacement for a portion of the wooden grid decks in existing cooling towers. Used in this way, it is possible to increase the cooling capacities of towers already installed, which can mean substantial savings for a company or plant that has outstripped its cooling facilities.

Poly-Grid is versatile and may be applied to other operations where efficient gas-liquid contact is desired, such as in gas scrubbing towers and trickling filters.

Development of the Poly-Grid packing is an important example, therefore, of an industrial application where formability, strength, and corrosion resistance make new high-impact plastics a heavy contender with other materials of construction.—END

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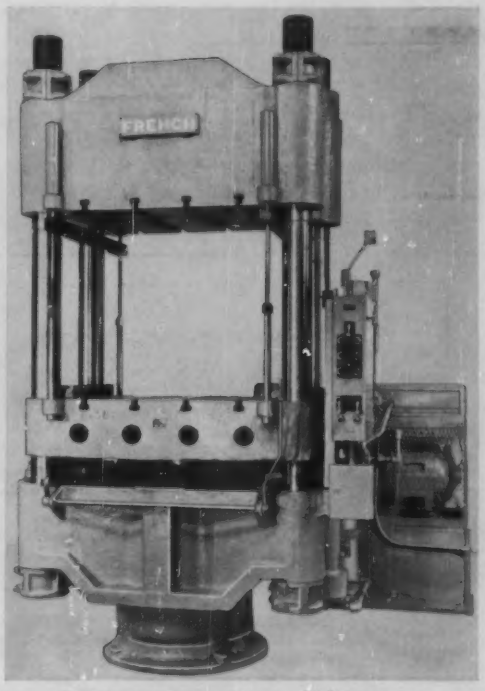


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## Predrying of

(*From pp.* 120-122)

lon is the level sought, air at any absolute humidity exceeding 0.010 lb. water/lb. dry air will require predrying. This corresponds to air at 70° F. and 63% R.H.

### What kind of dehumidifier?

Two methods of dehumidification—chemical and mechanical—are in common use, and dehumidifiers of either type are available for use with drying equipment. Chemical types, using silica gel or some other desiccant, if operated at the proper rates, can get the air extremely dry, but require frequent regeneration. In practice they are conveniently used in pairs, one being on stream while the other is being regenerated, i.e., dried, by very hot air. For effective operation the air to be dried by the desiccant must be cooled to about 100° F. If the hot air in the dryer is kept dry by recirculating it through the desiccant, it must be cooled below that temperature and, of course, reheated in the dryer. This means wasting a good bit of heat. However, recirculation with cooling may be more economical on humid days than the more frequent regeneration required by continuously drawing in fresh moist air. Desiccants used in these dehumidifiers have sometimes suffered from loss of effectiveness in drying of plasticized or monomer-containing resins. Apparently these organic compounds and/or their oxidation products are not completely removed during the regeneration cycle.

The other method of dehumidifying the air is to refrigerate it one way or another, as is done in air-conditioning equipment. Most of these mechanical dehumidifiers deliver air at 60° F. and 100% R.H. In this condition it can theoretically dry 6/6 nylon down to 0.23% water, though with this entering air it will probably take an inordinately long time to achieve any level below 0.25 percent. This water content should be satisfactory for most molding jobs, but where the material must be drier, the chemical dehumidifier or a special low-temperature mechanical dehumidifier will be needed.

### Conclusions

Most materials can be satisfactorily dried by simply exposing them to a stream of heated ambient air. Hygroscopic materials will have to be dried with dehumidified air during hot, humid weather. In extreme cases, the water content of the drying air may have to be maintained at such a low level that exceptionally effective predrying equipment is needed. On the other hand, winter air in the U.S. is sufficiently dry most of the time so that air going into the dryer need not be predried if turnover is high.

At present our knowledge of drying rates and even of equilibrium moisture levels is woefully inadequate. This lack of information has been reflected in the past in complaints on performance of drying equipment, and is undoubtedly costing many molders unnecessary investment in overdesigned equipment.—END

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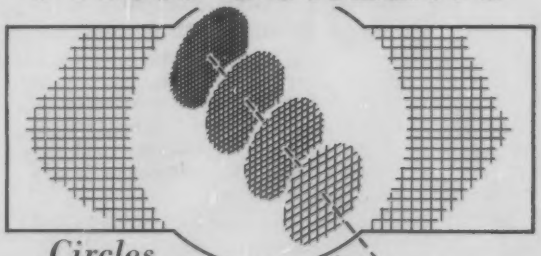

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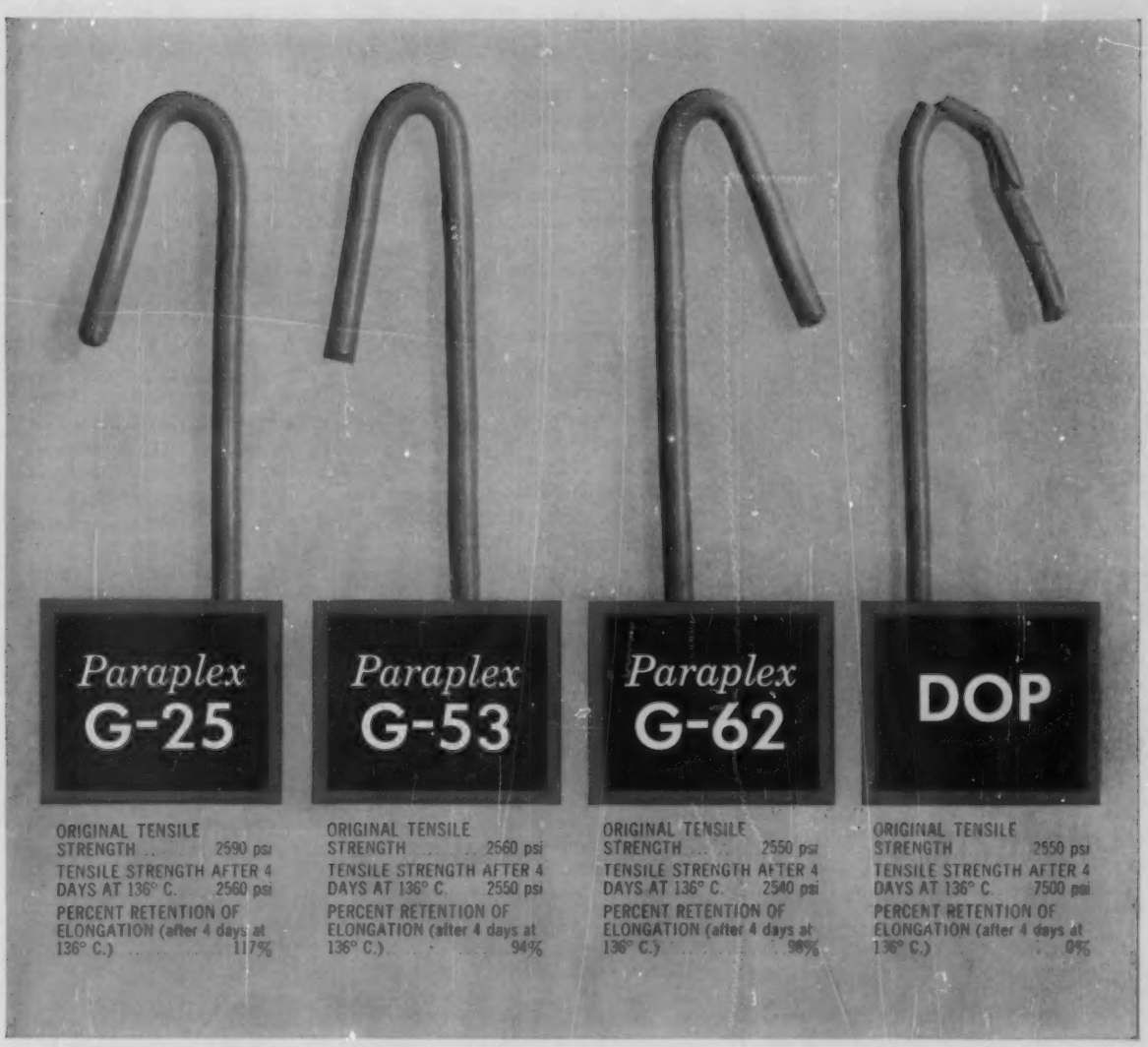
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ORIGINAL TENSILE STRENGTH 2560 psi
TENSILE STRENGTH AFTER 4 DAYS AT 136° C. 2550 psi
PERCENT RETENTION OF ELONGATION (after 4 days at 136° C.) 94%
Paraplex G-62
ORIGINAL TENSILE STRENGTH 2550 psi
TENSILE STRENGTH AFTER 4 DAYS AT 136° C. 2540 psi
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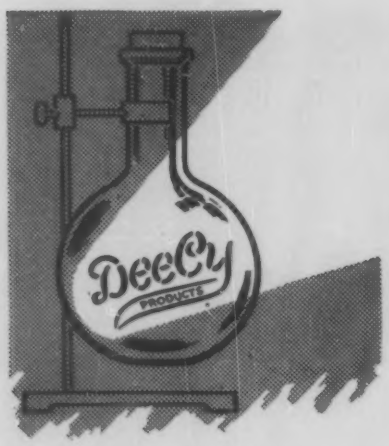


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## Low-toxicity

(*From pp. 125-128*)

same resin at room temperature. In this connection, it was found that terminal methyl groups improve resin miscibility. For instance, N,N′-bis-(hydroxypropyl)diethylenetriamine is miscible in all proportions with the same epoxy resin at room temperature.

### Chemical resistance

The chemical resistance of the cured thermoset masses was measured according to A.S.T.M. D543-52T by immersing samples for 7 days at 25° C. in a number of solvents and noting the percent gain in weight. These data are summarized in Table III, p. 128. At the present time, it appears that fully but more slowly cured materials have a higher chemical resistance than their faster curing homologs. This indication tends to reinforce the theory that a slow orderly cure favors more complete cross-linking. In common with observations made in other resin systems, the introduction of aromatic structures, such as N-hydroxypropyl-*m*-phenylenediamine and N-(2-phenyl-2-hydroxyethyl) diethylenetriamine, also provides improved chemical resistance.

It was found that slow cure in thin films at room temperature was particularly annoying in glass-cloth hand lay-ups, an area where a low-toxicity system was particularly desirable. Edgewise compressive strength, which is a measure of adhesion to glass, was lower than expected of an epoxy-glass laminate, and in fact, delamination in flexure was occasionally encountered. Inspection of faster setting compounds than the hydroxyethyl- diethylenetriamine materials revealed serious drawbacks, abnormally short working life, or expensive raw materials.

The reaction of the hydroxyalkylated polyamines with glycidyl ethers is subject to acid catalysis. A direct and readily satisfactory use of this phenomenon was the modification of the N-hydroxyethyl-diethylenetriamine by the addition of 4,4′-isopropylidenediphenol. Other catalysts, such as boron trifluoride, phenol, and various novalaks, also proved to have interesting effects.

The phenolic-modified amine being offered experimentally, ZZLB-0814, is more viscous than the unmodified chemicals heretofore discussed, but lower in viscosity than most commercial hardeners. Without shortening the working life seriously, problems of thin-film cure and low edgewise compressive strength were reduced or eliminated (Table IV, below).

An empirical study of the effect of the amount of modified hardener to be used with the resin showed optimum values when bisphenol was ignored as primary reactant in the calculations.

The availability of these hardeners with lower skin toxicity offers a means for overcoming one of the major deterrents to the use of epoxy resins.—END

**Table IV:** Properties of epoxy castings and laminates with various ZZLB-0814/bisphenol A combinations

| *Property* | *—Parts of bisphenol A per 100 parts of ZZLB-0814[a]—* | | | | |
|---|---|---|---|---|---|
| | *0* | *10* | *20* | *30* | *40* |
| Viscosity at 25° C., cp. | 400 | 900 | 1800 | 2900 | 3500 |
| Parts/100 parts epoxy resin | 20 | 22 | 24 | 26 | 28 |
| Working life, 50-g. mass at 25° C., min. | 20 | 19 | 17 | 15 | 14 |
| Peak exotherm, 50-g. mass at 25° C., °C. | 220 | 200 | 210 | 213 | 210 |
| Heat distortion temp., °C. | 92 | 90 | 89 | 84 | 78 |
| Edgewise compressive strength (12-ply glass cloth laminate gelled at 25° C.), p.s.i. | 10100 | 13500 | 14700 | 16100 | 10000 |

[a]ZZLB-0814=N,N′-bis(hydroxyethyl) diethylenetriamine

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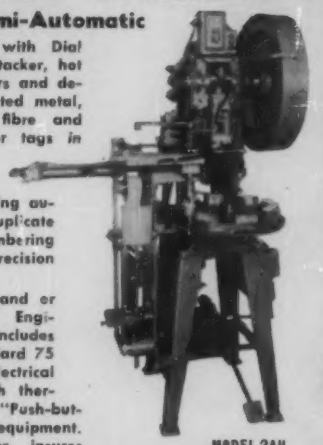

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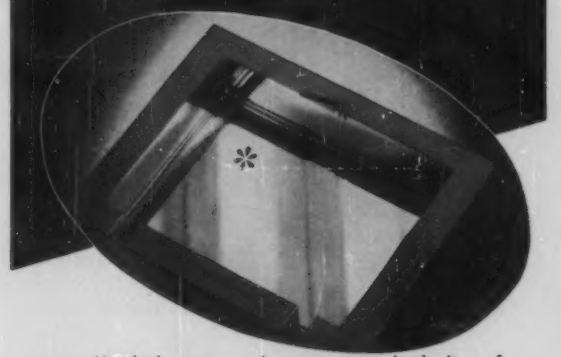

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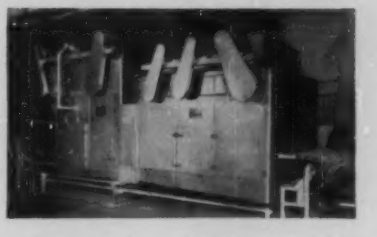

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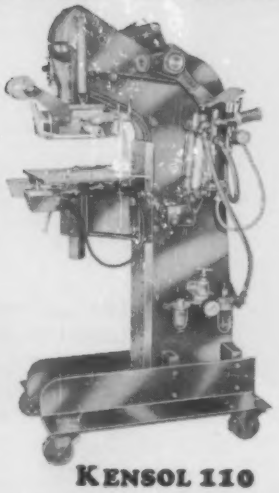

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## Formulating

(*From pp.* 133-138)

tion. For a cleaner mix, a small amount of talc was included. To reduce the tendency to stick in the mold, stearic acid was substituted for zinc stearate. To maintain rigidity (flexural modulus) the total filler content was maintained at the original 40 percent.

Compound E 2 is typical of several formulas that solved the difficulty. However, further work with E 1 and with compounds like E 3 containing no C.W.F. clay demonstrated that variations in the product molded from compound E 1 were due entirely to the non-uniformity of the compound, which in turn was traced to the dirty mixer. Enough material of varying composition was carried from batch to batch or scraped from the mixer shell and added to the finished compound to cause significant variations in the composition of the resulting molded parts.

*Example F—Putty compounds:* A class of premix compounds that contain no long fiber reinforcement has found application in small electrical parts such as plugs, condensors, etc., where the only object is to encapsulate some functional part in a protecting envelope. These compounds usually contain some fibrous material such as fibrous talcs, short fibered asbestos, short milled glass fibers, and/or short synthetic fibers. The reinforcing agent in compound F 1 (Table VI, p. 138) is Wollastonite F1, a fibrous calcium silicate.

*Example G—Effect of improper addition of catalyst:* To illustrate the effect of adding catalysts to a premix compound after adding the inert fillers, compounds used to mold a very thick terminal block were mixed on an intensive-internal mixer as shown in Table VII. Compound G 1 would not mold satisfactory parts until it was 2 to 3 days old. Compound G 2 molded satisfactory parts after aging only 6 hours. By running the gel times of the compounds as they aged, compound G 1 was found to have a very long gel time initially which shortened on aging to compare with those of compound G 2.—END

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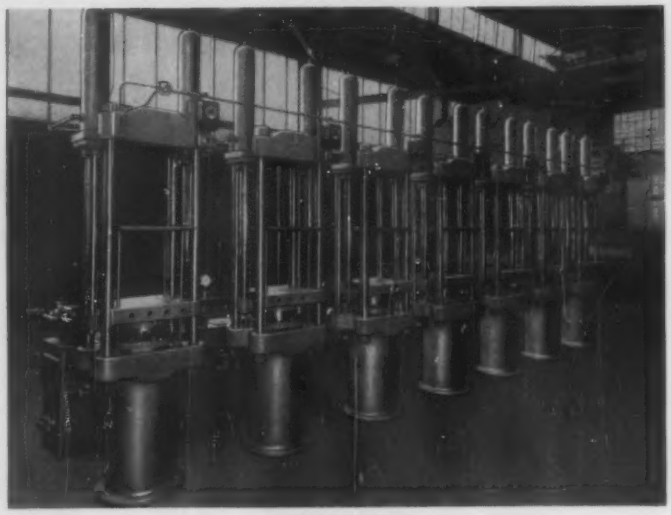

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## A method for testing

(*From* pp. 140-144)

molding area[2] determines the cylinder temperature and injection pressure limits with which a material may be molded. The molding cycle and mold temperature are held constant. This technique consists of gradually increasing pressure at a constant temperature until the mold cavity is just full and then increasing further until it sticks or flashes. These points are then recorded on a graph. Cylinder temperatures are then increased by a specific amount and a second set of short and stick joints are found. The process is repeated until the temperature limitation of the material is reached.

The numbers listed on the plot are the plays required of the records molded at this condition to increase the IM distortion 3 percent. This is the approximate level of distortion required before detection can be made by the human ear.

[2]Semeyn, Don B., "A measure of plastic moldability," SPE J., *12* (May 1956).

With a wear life of approximately 100 plays considered satisfactory for the average record by the manufacturers, most of the molding conditions shown in the graph would produce a usable record. However, at certain conditions within the molding area, unusually good records with better wear properties can be molded with Q-936.1. These areas are indicated on the graph by the lighter portion within the diagram.

In Fig. 10, p. 142, which is an enlargement of the upper portion of the molding diagram, four points are shown that have a wear life which is in excess of 250 plays.

It is interesting to note that these points are relatively close to the short shot line and that increasing the injection pressure reduces the life of the record.

From these graphs it should be quite obvious that within the molding diagram there is a narrow range of conditions at which records of superior quality can be molded. It should be stressed that the data shown in Figs. 9 and 10 are pertinent only for the particular machine and material used.

To find the correct molding conditions for other machines or materials, data of this type should be obtained for each material and each machine used.

However, phonograph records have been molded that will withstand up to 1000 plays before showing signs of wear. It is to the formulator's, the manufacturer's, and the consumer's advantage to have phonograph records injection molded at the optimum processing conditions and at no increase in the final cost of the product.

By using measurements such as IM distortion it is possible to screen record materials quickly and accurately. Such variables as proper molding conditions and the human ear can be completely eliminated by the proper use of these tools.

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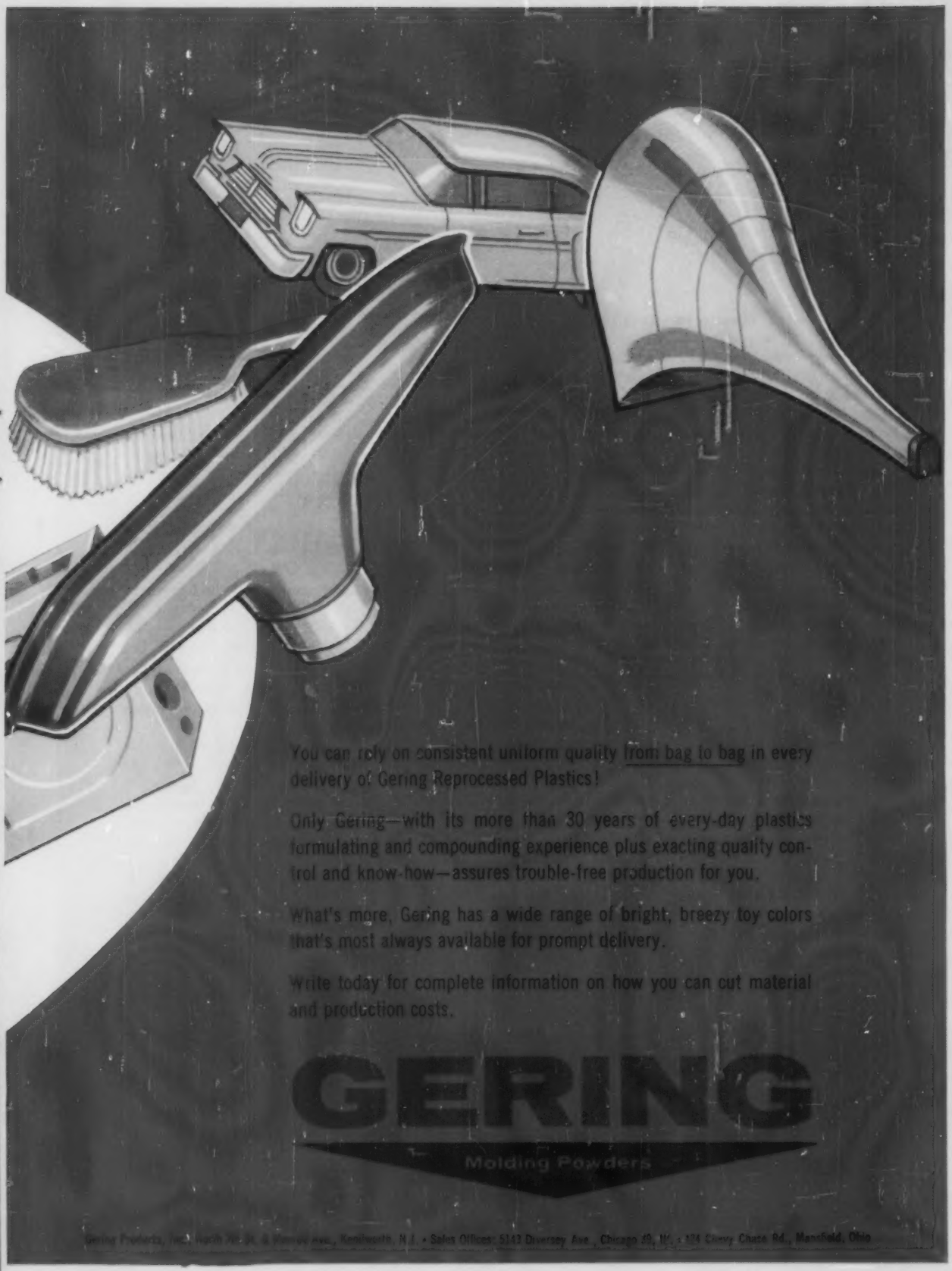
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# Plastiscope

News and interpretations of the news
By R. L. Van Boskirk

**Section 2** *(Section 1 starts on p. 39)*

## Exports in 1956

Final figures released by the U. S. Tariff Commission for 1956 show that close to 58 million lb. of polymer and copolymer containing 60% or more styrene, 33.7 million lb. of uncompounded vinyl chloride and copolymer, and 13.7 million lb. of compounded (about 50% resin) were exported from the United States.

For styrene, this is the third consecutive year that has shown a major increase. In 1954, the figure was 33.3 million lb., in 1955 it was 44. With several U. S. firms establishing foreign operations, it is questionable, however, that this trend will continue. Both Dow and Monsanto are establishing facilities in Japan—which in 1956 received about 25% of our styrene exports.

Leading importers of U. S. styrene (not counting Canada) in 1956 were Japan, with 14 million lb.; and France and Belgium, with 4 million lb. each.

The 1956 figures for vinyls leveled off and probably indicate that the export market for vinyl chloride is on the way down because of the construction of so many vinyl plants in other countries. In 1954, uncompounded vinyl was exported to the tune of 31.5 million lb.; in 1955, 35 million. Leading importers in 1956 were Canada, 15.1 million lb.; the United Kingdom, 6.25 million; and Japan, 1.9 million. Mexico and Cuba were the only other countries taking over 1 million pounds. Compounded vinyl (ca. 50% resin content) was exported at the annual rate of 10.8 million lb. in 1954, 16 million in 1955. Major customers were Canada, 2.6 million lb.; Republic of Korea, 1.8 million lb.; Argentina, 0.94 million; and Mexico, 0.71. An interesting item is that Italy was one of the largest importers (701,000 lb.) despite the fact that Italy was the largest exporter of vinyl chloride to the United States (12 million lb.). The United Kingdom exported 571,000 lb. to the United States and Germany sent over 42,000 pounds.

Other plastics with a sizable export figure are urea and melamine. The 1956 total export was 17.8 million lb.; 1955 was 16; 1954 was 17. Next to Canada, the Philippine Islands and Mexico were the largest importers, with South American countries high on the list. Italy and Switzerland were the chief European importers. For some unexplained reason, New Guinea imported 562,000 lb., to place fifth highest on the list.

### Melamine and chinaware

Fostoria Glass Co., Moundsville, W. Va., has announced plans to enter the melamine dinnerware field with an initial line of four colors and several applied decorations. The design was developed with the assistance of Latham, Tyler & Jensen, Chicago, Ill. To be known as Fostoria melamine dinnerware and to be sold through the firm's own sales organization, the new product will be ready for shipment to the stores during the fall.

This move by Fostoria is indicative of melamine's triumph in the dishware field. Fostoria is only one of several chinaware producers that have already joined the melamine parade. A few years ago, the china producers scoffed, railed, and ranted at the very idea of melamine dishware. Today they are penitent advocates of the old axiom, "If you can't whip 'em, join 'em."

Chicago Molded Products has joined with Fostoria in the production of its melamine dinnerware, which will be produced and shipped from the Georgetown, Ill., plant. This will afford the company a centrally located distribution point for the country.

### Fibrous sheet for filtration

Tetrafluoroethylene fibrous sheets, to which the Fabrics Div. of Du Pont has given the tradename "Armalon," combine properties suggesting their use as filter media where other paper-like structures are not satisfactory. In the matter of heat resistance, these sheets can withstand seven days' exposure at 550° F. Their chemical resistance has been tested by seven days' immersion in concentrated sulfuric, hydrochloric, nitric acids, etc. Specific uses for Armalon sheet might include filtration of strong acids and bases, virtually all solvents, liquid fuels, lubricants, and hydraulic fluids over a wide temperature range.

Laboratory data indicate that Armalon fibrous sheets are effective in removing very fine particles from liquid suspensions under severe conditions. Another potential application is the removal of suspended particles from hot, corrosive gases. Not readily wetted by water, the new sheets may also be useful for separating water droplets from many organic liquids, such as gasoline.

### Dispersion compounds for coating

Rate of growth for vinyl chloride dispersion (plastisol and organosol) resins as a metal coating is expected to zoom upward in the next five years at a rate comparable with that of dispersion resins in other fields for the past five years. Only estimates are available on sales of dispersion resins, but it is believed that volume has grown from around 30 million lb. to well over 70 million

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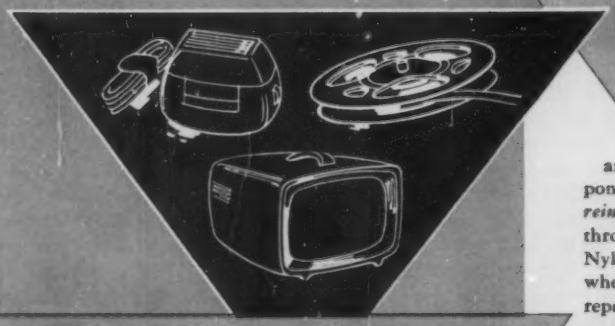

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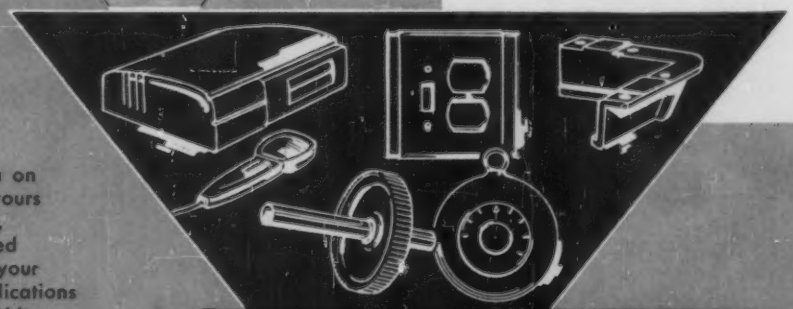

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# The Plastiscope

lb. in that period. The principal uses have been for cloth coating, slush molding, and dip coating. Plastisol for vinyl foam is also a part of the pattern. Acceptance of dispersion compounds on a mass basis has been because of their unique properties which permit use of low-cost equipment and ease of fabrication.

In the last year or so, surface coatings made from plastisols or organosols to apply on metal surfaces have made good progress and promise to become just as successful as the dispersions mentioned above. One type is for spray, dip, or brush coating; the other is for spread coating on steel by a method reminiscent of cloth coating and which is described on page 43 of this issue. Vinyl-coated metal panels that can be deep drawn and with a variety of patterns in unlimited color are a product with a future that defies imagination if they prove economically and structurally feasible.

However, Dennis Chemical Co., which produces both types of dispersion resin surface coatings, is convinced that no matter what happens to the spread-coat type of compound, there will continue to be a growing market for spray-coat dispersions (as distinguished from spread coating) for many years to come. Its spray coating (dip or brush also) formulations use from 20 to 50% plasticizer and can be coated in thicknesses of from 2 to 50 mils in one application. High durometer plastisols such as Dennis No. 9178 are limited to a thickness of 4 mils per coat. Lower durometer compounds can be applied in thicker coats. For example, a 15-mil coating will usually hide the defects in cast metal surfaces. A 15-mil coat can be applied by a single spray application to give a smooth, high gloss surface. Those compounds which are applied at the rate of up to 50 mils per coat usually have a textured surface. The baking time varies but averages 10 min. or so at a 350° F. temperature. Induction heating is used for large parts, radiant heating for small parts.

Dennis claims that success of the coating system for its spray, as well as spread coat compound, depends upon use of a primer which will give good adhesion and be easily applied. The No. 2386X Denflex Primer is generally used for most spray coating applications. Where exceptional resistance to high humidity, salt spray, continuous water immersion, and chemicals is required, the No. 2394 Primer is used.

Suggested applications for vinyl spray coating compounds are home appliances, waste baskets, cold chests, thermos bottles, lawnmower housings, or almost anywhere that a formed metal piece is part of an assembly.

Other Dennis formulations, aside from those already mentioned, are for mechanically blown vinyl foam used on its patented Fay foamer; a compound used as a seal for sewer pipe; and a strip coat for chrome or polished metal.

### Vinyl sheet from Europe

Non-Tac clear vinyl sheeting, calendered in Europe from European virgin PVC resin and sold in the United States by H. B. Strauss Co., 131 Water St., New York, N. Y., is a low-plasticizer-content material said not to have the tackiness frequently encountered with other (especially press-polished) vinyls. The sheet is polished on both sides during the calendering operation and, while not as clear as press-polished vinyl, is claimed to have ample clarity for such applications as comb cases, card cases, book covers, and other see-through holders. Its low plasticizer content gives the sheet a firmness that is higher than that of conventionally plasticized vinyls of the same gage.

Non-Tac is available in 40-in. width in gages from 0.004 to 0.014 in., supplied in roll form. Prices range from 40¢/yd. for the 4-gage material to 90¢/yd. for the 14-gage sheet.

The company is also offering Non-Stat vinyl sheet, said to incorporate permanently anti-static properties, for use in hospital tents, aprons, bed sheets, trolley covers, etc.

### Polyester resin volume

Sales of reinforced plastics in the first quarter of 1957 were between 20 and 25% ahead of last year, according to Clare E. Bacon, chairman of the Reinforced Plastics Div. of The Society of the Plastics Industry, Inc. He also asserted that total production of finished reinforced plastics was 140 million lb. in 1956; but this latter figure, of course, includes the epoxy and phenolic resins used in reinforced plastics, as well as the polyesters, and also the weight of the reinforcements themselves, plus the reinforcements.

Increased sales in the first quarter of 1957 came partly from the boat field, in which there were more orders than there was capacity.

Improved heat resistance was another factor in improving sales. For example, Chrysler is using reinforced plastics transmission gears that operate submerged in hot oil. Tool handles are another possibility.

The increase claimed by Mr. Bacon, which was based on an industry survey, is modest when compared to the U. S. Tariff Commission's monthly reports on total polyester resin consumption, unless the base figure used in 1956 by Mr. Bacon was too high. In any case, the amount of all types of polyester resin consumed in the first quarter of 1957 was over 20 million lb. compared with 13.5 in 1956, according to the Tariff Commission. The big question is: How much of it was used for reinforced plastics?

**How was use split?** It is probable that at least 11 million lb. of polyester resins were used for casting, fibrous glass mat bonding, and buttons in 1956. Several million pounds more were the adipic type used for polyurethane and it is also almost a cer-

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# The Plastiscope

tainty that another chunk went into the paint business, even though polyesters used for paint are supposed to be in another section of the Tariff Commission's report. Polyesters used for Mylar and plasticizers are definitely reported in another section of the Tariff Commission's data book and so have no bearing on this particular discussion. When resin for the above named uses is deducted, the total amount of polyesters consumed for reinforced plastics in 1956 may have been around 50 million pounds.

It is believed that not more than 10 or 11 million lb. of the polyester resin in the 1956 Tariff Commission report were used for reinforced plastics in the first quarter of 1956. If the reinforced plastics use of polyesters increased by 25% in the first quarter of 1957, it would account for around 14 million lb. of resin. The resin producers think that figure is low because it leaves too much for other purposes. Urethanes may have accounted for 2.5 or 3 million lb. of polyesters in the first quarter, but it is doubtful that other uses accounted for the remaining 3 million or so pounds.

However, first quarter consumption of all polyesters in 1956 was well below the other three quarters, which were respectively 18, 15.5, and 18 million pounds. Thus, any attempt to measure 1957 consumption by first quarter results is unreliable. The first quarter of 1957 (20 million lb.) may be a continuation of the increasing quarterly growth shown in 1956 and the harbinger of a 90 to 100 million-lb. polyester figure in 1957.

**The figures are complicated.** A lot depends upon how much adipic type polyester is used for urethane in the last half of 1957, and that again depends upon whether or not the polyethers eat into the polyester-urethane business before this year is over. It is possible that 15 million lb. of adipic acid polyesters may be used in 1957, but there are only a few optimistic souls who believe it. Polyesters other than those used for reinforced plastics or urethane are not expected to be much over 15 or 20 million in 1957. But polyesters for reinforced plastics seem to be definitely on the march at long last. They could reach a total consumption volume of 75 million lb. in 1957 if growth continues as it has during the last 18 months.

Complicated? Yes, indeed, but the volume of polyester resins consumed will always remain complicated until producers report their production accurately and according to the instructions printed on the Tariff Commission report blanks.

### Cycolac in tiny pellets from big new plant

Availability of Cycolac, high-impact acrylonitrile-butadiene-styrene resin in a smaller, more uniform pellet size, has been announced by Marbon Chemical, Div. of Borg-Warner Corp., Gary, Ind. The company states that the smaller pellets, 3/32 in. in size, make possible greater uniformity of heat transfer, necessary for obtaining maximum shot size and a good surface. The new size is also said to have a definite effect on cycle time and fill and to reduce the possibility of overheating.

Other advantages claimed for the pellets are improved hopper loading and better hopper flow.

A $10 million chemical plant, representing Borg-Warner's first large-scale investment in the plastics field, has gone into production, according to the firm. Robert Shattuck, president of Marbon, states that although Cycolac was introduced scarcely three years ago, the material has already been adopted by manufacturers for more than 100 different products.

Plumbing pipe made of Cycolac resin will withstand many hundreds of pounds of pressure and will resist corrosion and acid which affect steel and iron pipes. In a recent test, a face-protector mask, formed of Cycolac resin, withstood blows of a baseball bat. The material is so heat resistant that it can withstand boiling water and so soluble that it can be sprayed.

### New caster

Plasti-Skill, 102-06 Thirty-seventh Ave., Corona, N. Y., is a newly formed company specializing in custom casting epoxies, polyesters, phenolics, and plastisols. Primary activity at present is in the display field.

### S.P.E. in the Rockies

Organization of the Rocky Mountains Section of the Society of Plastics Engineers, Inc. has been announced. The new group takes in northern New Mexico; southern Wyoming; western Nebraska; Salt Lake City, Utah; and Colorado. Meetings will be held the third Thursday of each month.

The following officers were elected: president—Oscar B. Yorker, Yorker & Sons, Inc.; vice president—Paul Barrick, University of Colorado; secretary—J. Ellis Chaney, Chaney Plastics Co.; treasurer—Ray Millard, Denver Plastics.

### Sealable PVC inks

Electronically heat-sealable vinyl gravure inks in a complete range of colors, including lightfast golds and silver, are being manufactured by Claremont Pigment Dispersion Corp., Roslyn Heights, N. Y. According to the company, prints for automotive upholstery applications, with up to 100% coverage, have been satisfactorily heat sealed on commercial electronic heat-sealing equipment without destructive arcing.

### Methacrylate casters grow

The cast methacrylate sheet business, which a few years ago was practically a monopoly, has been quietly broadening its base and today encompasses (at latest count) 15 firms. Most recent to announce its entry into the field is Glasflex, Inc., Stirling, N. J., which casts sheet in thicknesses from 0.030 to 0.250 in. in maximum widths of 36 inches. Of the 15 companies, four cast pearles-

(*To page* 221)

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**SPRAY MASKS.** Illustrated folder describes company's manufacture of spray masks for plastics finishing and marking applications. Jas. H. Matthews & Co. (H-702)

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**PRODUCING PLASTIC FOAM.** Illustrated folder describes machine for producing polyurethane foams of any formulation and discusses use of foam. Includes specifications. Gabriel Williams Co., Inc. (H-704)

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**"KEL-F" ELASTOMER.** 12-page illustrated booklet discusses "Kel-F" fluorocarbon elastomer, suitable for gaskets, O-rings, electric connectors, hose, tubing. Also discusses methods of fabrication. M. W. Kellogg Co. (H-710)

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**SHEET, ROD, TUBE CATALOG.** 64-page catalog contains data on sheet, rod and tubing, in a wide range of materials, available from this company. Includes prices, sizes available. Kaufman Glass Company. (H-712)

**FIBROUS GLASS REINFORCEMENTS.** Literature discusses qualities of reinforcing, surfacing and carrier, low density, and bonded mats for fibrous glass reinforcements. Includes diagrams of grain structures. Modigliani Glass Fibers, Inc. (H-713)

**MOLDED PLASTICS MANUAL.** 8-page booklet contains case histories of molded plastics applications developed by Illinois company's compression, transfer, injection custom molding service. The Richardson Co. (H-714)

**DETECTING LEAKS IN PROCESS EQUIPMENT.** Literature describes unit for locating leaks in high vacuum, pressure equipment, hydraulic systems, and manufactured products. Unit provides both audible and visual signals. NRC Equipment Corp. (H-715)

**EXTRUDERS.** Illustrated literature describes extruder with 2½ in. bore, and one with 3½ in. bore. Davis-Standard. (H-716)

**WEB CONTROL CATALOG.** 32-page catalog serves as guide to selection of web control devices and gives comprehensive data on a beta gauge control unit for continuously indicating thickness or weight of plastics web-fed material. Tracerlab, Inc. (H-717)

**FUSING AND DRYING MACHINES.** Booklet describes curing, fusing, and drying equipment for processing coated web stocks. Machines are suitable for fusing vinyl coatings, setting phenolics, and drying coatings and lacquers. F. C. Dawson Engineering Co. (H-718)

**PIGMENTS FOR PLASTICS.** Literature describes company's non-bleeding, heat-resistant pigments. Discusses permanency to light, heat resistance. Pigment samples provided with literature. Imperial Paper & Color Corp. (H-719)

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**MACHINE FOR MARKING PLASTICS.** Illustrated literature describes machine that automatically applies continuous marking to rigid, semi-rigid, and flexible plastic pipe, hose and tubing of ⅛ to 6 in. diameter. Kaumagraph Company. (H-721)

**POLYETHYLENE MANUAL.** 16-page manual provides processing data on injection molding, blow molding, and extrusion of company's "Super Dylan" polyethylene. Gives physical properties, chemical resistance. Koppers Company, Inc. (H-722)

**STATIC NEUTRALIZER MANUAL.** 8-page illustrated manual discusses the various methods employed to neutralize static electricity on sheeting or film. Describes "magic wand" neutralizing technique with diagrams and installation data. Herman H. Sticht Company, Inc. (H-723)

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**POLYVINYL METHYL ETHER.** 12-page technical booklet describes properties, compatibility with other resins and polymers, and viscosity of polyvinyl methyl ether suitable as a heat-sensitizing agent for latices; a tackifier or plasticizer for adhesives, cements, lacquers and coatings. General Aniline & Film Corp. (H-725)

**POLYSTYRENE SPECIFICATIONS.** Folder contains specifications and suggests uses for company's "Fostarene" line of general purpose, high impact, and high flow polystyrene resins. Foster Grant Co., Inc. (H-726)

**STEAM BOILERS.** 8-page catalog describes line of 12 to 125 hp. gas-fired, oil-fired, combination gas/oil-fired boilers for providing steam heat. Includes cross-section diagram, specifications. Eclipse Fuel Engineering Co. (H-727)

**PAPER-BASE LAMINATE.** Bulletin describes paper-base phenolic laminate and compares properties with other laminates. Provides fabrication data, electrical properties. The J. P. Lewis Co. (H-728)

**STEELS FOR PLASTIC MOLDING.** Catalog discusses special purpose steels for plastic molding, including hobbing, master hob, and machined-cavity steels. Includes instructions for working steel, and data on heat treatment. Bethlehem Steel Company. (H-729)

**INDUSTRIAL FASTENERS.** Illustrated folder describes line of metal screws, hinge-locks used for a variety of industrial closure applications. Simmons Fastener Corporation. (H-730)

**EXTRUDED ROD AND TUBING.** Folder lists specifications for nylon, cellulose acetate butyrate, methacrylate, polyethylene rod and tubing, polystyrene rod, and vinyl tubing extruded by this Connecticut company. Jessall Plastics, Inc. (H-731)

**TEFLON, NYLON PARTS.** Literature describes Teflon and nylon rod, sheet, tape and tubing, and specially machined parts, available from this New Jersey company. Also describes Teflon-lined flexible hose assemblies, providing specifications and illustrations. The Mac-Lin Company. (H-732)

**EPOXY TOOLING RESINS.** 8-page illustrated folder describes line of epoxy casting resins. Includes illustrations of patterns and core boxes cast from resins; gives casting instructions. Kish Industries. (H-733)

**ELECTRIC STRIP HEATERS.** Folder diagrams wide variety of applications for line of strip heaters for heating liquids, gases, platens, molds, tanks. Includes case-history illustrations, specifications. Edwin L. Wiegand Co. (H-734)

**RIGID POLYETHYLENE.** 8-page booklet describes "Marlex 50" polyethylene, illustrating possible applications and company's facilities for production of the resin. Phillips Chemical Company. (H-735)

**ENGRAVING EQUIPMENT.** Illustrated catalog sheet describes and lists prices for cutter, grinder, electric etching engraver, drill press, and name plate edging machine. Mico Instrument Co. (H-736)

**TRIMMING VACUUM FORMED PARTS.** Booklet illustrates dies for flash-trimming vacuum-formed plastics. Also shows dies made by this company for deflashing molded plastics. Western Supplies Co. (H-737)

**REPAIR OF REINFORCED PLASTICS.** Folder provides data on proper compounds and methods for repairing reinforced plastic parts, such as boat hulls and building panels, made of fibrous glass-reinforced "Vibrin" polyester. Naugatuck Chemical Co. (H-738)

**CUSTOM INJECTION MOLDING.** Illustrated brochure describes Illinois company's custom molding service and metal stamping facilities. Illustrates wide range of components and housings produced. Santay Corporation. (H-739)

**FILLERS FOR REINFORCED PLASTICS.** Literature discusses use of aluminum silicate pigments as fillers in reinforced plastics. Provides data on aluminum silicate pigment filled plastics. Minerals and Chemicals Corporation of America. (H-740)

**INFRARED HEATING.** Illustrated folder lists characteristics of industrial radiant heaters for heating, drying, curing. Includes specifications. N. J. Thermex Co., Inc. (H-741)

**INDUSTRIAL LAMINATES.** 8-page illustrated brochure provides detailed specifications chart, application data for company's paper-base and fabric-base laminates. Also discusses decorative laminates. Farley & Loetscher Mfg. Co. (H-742)

**INJECTION MOLDING MACHINES.** Illustrated catalog provides descriptions and specifications of line of 1/8, 5/10, 12/16, 16/20, 20/24 and 32 oz. injection molding presses. Reed-Prentice Corp. (H-743)

**POLYVINYL CHLORIDE RESIN.** 32-page illustrated brochure describes properties, processing data, applications of "Vipla" polyvinyl chloride resin. Includes corrosion resistance charts of unplasticized PVC. Chemore Corporation. (H-744)

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# CONOCO H-300*

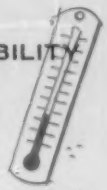
*the extender of profit*

## Try it as a secondary plasticizer with polyvinyl chloride resins.

As a primary plasticizer extender, the advantages of Conoco H-300 merit the consideration of all quality-minded and cost-conscious formulators using polyvinyl chloride resins. Some of these are:

### EXCEPTIONAL LIGHT STABILITY

Tests prove that films containing Conoco H-300 show light resistance equal to, or better than, those with no extenders—a unique contribution in the field of secondary plasticizers.

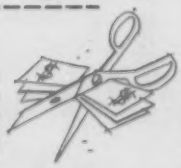


### UNUSUAL LOW TEMPERATURE FLEXIBILITY

Marked improvement in low temperature flexibility is shown in films made with Conoco H-300.

### SUPERIOR VISCOSITY CONTROL

Mixtures containing Conoco H-300 have appreciably lower initial and aged viscosities.



### ECONOMY

Can save the processor as much as 2 cents per pound on the finished product. Conoco H-300 can be used to the extent of 25% of the total plasticizer required.

### IMPROVED MIXING

Formulations are more readily mixed because of fast wetting and internal lubricating properties.

**In view of these advantages it will pay you to reanalyze your needs.**

For more detailed information, send for the new booklet on Conoco H-300: Continental Oil Company, Petrochemical Department, Division P-8, 1270 Sixth Avenue, New York 20, N. Y.—1353 No. North Branch Street, Chicago, Illinois.

**Conoco H-300 is available** in either tank cars or drums. Samples available on request.

CONOCO Petrochemicals

*Petrochemical know-how from the ground up!*

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## CONTINENTAL OIL COMPANY

PVC. Chemore Corporation. (H-744)

ALLIS-CHALMERS

# Dielectric Heaters

## The application list is growing...

- ✓ Drying cellulose sponge
- ✓ Setting resin adhesives for wood bonding
- ✓ Gelling, curing, drying foam rubber
- ✓ Drying crumb rubber for Mooney test control
- ✓ Curing resin-impregnated paper
- ✓ Setting twist for rayon cord
- ✓ Heating plastic preforms
- ✓ Laboratory and research projects

Allis-Chalmers dielectric heaters are available in a complete range from 3 kw to 100 kw.

## *You, too,* can

## cut costs · save space · speed production with Allis-Chalmers dielectric heaters

Processing time measured in minutes . . . maximum production per unit of floor space . . . streamlined work flow . . . minimum heat loss . . . improved working conditions . . . simplified operation — these advantages are yours with the Allis-Chalmers dielectric heater.

If your processing requires the heating of non-conducting materials, the application of Allis-Chalmers dielectric equipment and engineering will mean faster production and lowered costs. The experience gained by Allis-Chalmers engineers in designing hundreds of dielectric and induction heating installations is available for your operations.

See your nearby Allis-Chalmers representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. Ask for bulletin 15B6431C.

**ALLIS-CHALMERS**

A-5303

# The Plastiscope

cent sheet. All firms probably use virgin monomer since it is cheaper to synthesize monomer than to reclaim scrap sheet, which involves grinding it up and depolymerizing it.

Companies currently in the field include the following (those casting pearlescent sheet are indicated by*): Rohm & Haas Co., Philadelphia, Pa.; Cast Optics Corp., Hackensack, N. J.; Polycast Corp., Stamford, Conn.; Wasco Products, Inc., Cambridge, Mass.; Pearl Plastic Co.,* Metuchen, N. J.; Cadillac Plastic & Chemical Co., Detroit, Mich.; Heat-Resistant Plastics Corp., Ozone Park, N. Y.; Nacron Plastics, Inc.,* Jersey City, N. J.; Debra, Inc.,* New York, N. Y.; Acryvin Corp. of America* (rumored to have been purchased by I.C.I.), New York, N. Y.; U. S. Plastic Products,* Metuchen, N.J.; Larc Products, Inc., Amsterdam, N. Y.; Aristocrat Plastics, Inc., Newark, N. J.; and Plastic Glass Corp., Newark, N. J.

### Improved PVC stabilizer

A liquid barium-cadmium stabilizer, recommended by the manufacturer for calendered, molded, extruded, and plastisol formulation, has been introduced by Ferro Chemical Corp., subsidiary of Ferro Corp., Cleveland, Ohio. Designated #1212-A, the stabilizer is stated to represent a considerable advance over #1212, also marketed by Ferro. In terms of end product qualities, the new formulation is reported to give better initial and long-term heat and light stability than 1212, to produce clearer vinyls, to impart less odor, and to produce truer whites and colors.

According to Ferro, 1212-A is easily dispersed with DOP and DOA plasticizers, is soluble in most phosphate and epoxy plasticizers, does not increase viscosity build-up of plastisols during storage, and has a low sulfur-stain potential.

Price for 1212-A is identical to 1212: 67¢/lb. in truckload quantities; 68¢ in orders down to 4500 lb.; and 70¢ in drum lots. Since the prices are the same but the performance properties of 1212-A superior to those of 1212, it is anticipated that the former will soon replace the latter.

### New custom processor

Electronic Plastics, Inc., Matawan, N. J., is a newly formed company specializing in extruding high-temperature-resistant plastics-insulated wire and custom molding electronic component parts. Currently offered is a line of hook-up wire in all 14 Signal Corps colors, insulated with Kel-F.

Warren L. Schnur is president.

### Makes own epoxies

Production, on a relatively small scale, has been started by Permacel Tape Corp., New Brunswick, N. J., on its own line of epoxy resins. The company had formerly distributed Epocast epoxies produced by Furane Plastics, Inc., Los Angeles, Calif. (Epocast is a Furane tradename.) In addition to offering its own resins, Permacel will also incorporate in its line epoxies produced by Furane, but will market them under the Permacel label. The company is currently exploring plans for an expanded epoxy operation.

### Acrylic paint sales up

The volume of arcylic latex paint used in the United States expanded by two thirds during 1956 and the number of paint companies producing arcylic paints increased from about 300 to approximately 450 during the year. Sales for the first quarter in 1957 also showed a healthy 35% increase over the first quarter of 1956. These facts were revealed in a recent talk by Gerould Allyn, coatings specialist of Rohm & Haas Co., given at a joint meeting of the Kansas City and St. Louis Paint and Varnish Production Clubs.

Export sales of arcylic latex emulsion during the year showed a 70% increase over 1955. Paint manufacturers in 32 foreign countries are now buying arcylic latex from the United States for the manufacture of water-based paints.

Actual sales figures for the three types of latex paints—butadiene styrene, polyvinyl acetate, and acrylic—have not been released by the producers, but it is known that production of water vehicle paints has been growing at the rate of at least 5 million gal./yr. for the past six years. Market estimates indicate that production for trade sales in 1956 probably totaled about 55 million gal., said Mr. Allyn.

External applications showed the largest volume growth during the year, with increasing amounts of acrylic paints being used in housing developments and in institutional and industrial maintenance.

Acrylic paints are also being adopted for a variety of difficult paint applications, such as subway stations, drive-in movie screens, asbestos shingles, and tile roofs.

### Vacuum Coaters meeting

A recent meeting was held in Cleveland, Ohio, to discuss further developments for the newly formed Society of Vacuum Coaters. The organization is primarily concerned with establishing standard techniques, practices, and business ethics in the field of decorative and functional vacuum coating.

The following committees were appointed: Financial; Program; Constitution and By-Laws; Publicity; and Membership.

Anyone interested in membership may contact M. S. Adler, F. J. Stokes Co., 211 Plymouth Bldg., 2036 E. 22nd St., Cleveland, Ohio.

### Two new phenolics from G-E

The addition of two new formulations—G-E 12980 and G-E 12981—to its line of phenolic molding materials has been announced by General Electric Co., Pittsfield, Mass.

G-E 12980 is a black, two-stage mineral-filled, high-heat-resistant molding powder claimed to pro-

# The Plastiscope

duce parts that can withstand temperatures to 500° F. It has a relatively low specific gravity of (average) 1.51, exhibits an average shrinkage of 3.5 mils/in., and is said to be characterized by good dimensional stability. Suitable for use in either cold-powder or preheated pill molding, 12980 can be molded at temperatures between 300 and 370° F., using conventional pressures. Suggested applications include skillet and other appliance handles, coffee pot bases, stove parts, and heating appliances.

G-E 12981 is a medium-heat-resistant mineral-filled black material designed to withstand temperatures to 400° F. Specific gravity is also about 1.51. It is suggested by the company for industrial applications such as circuit breakers, cord connectors, and thermostat knobs.

Both materials are claimed to produce moldings with a satin-smooth finish.

### Forms and bobbins

A line of custom fabricated winding forms, coil forms, and bobbins is offered by Thor Ceramics, Inc., 225 Belleville Ave., Bloomfield, N. J. The company states that it can produce them in epoxy, nylon, polyesters, fluorocarbons, polystyrenes, ceramics, and other materials.

### Colorants for polyethylene, vinyl

A line of colorants consisting of pigments dispersed in low-molecular-weight polyethylene is available from Harwick Standard Chemical Co., Akron, Ohio. Designated Stan-Tone GPE Colors, the 50% color-50% polyethylene dispersion is compatible with polyethylene, vinyl compounds, and rubber. According to the company, the colors are granular and non-dusting, and the full tinting power of the pigments is realized.

Stan-Tone GPE colors, extended with high-molecular-weight polyethylene resin, are offered in pelletized forms at any low pigment level desired. Because of the presence of the high-molecular-weight resin, extended GPE colors are not recommended for vinyl or rubber compounding.

### New silicon can be copolymerized

The first of a new family of organo-functional silicons, called Syl-Kem 21, has been announced by the New Products Dept. of Dow Corning Corp., Midland, Mich. The company claims that the new chemical can be copolymerized with acrylonitrile, styrene, vinyl acetate, and methyl methacrylate by conventional organic methods in bulk, suspension, or emulsion to yield a clear, tough, highly water-repellent plastic with a molecular weight of from 600,000 to 700,000.

Chemically, Syl-Kem 21 is pentamethyldisiloxanemethyl methacrylate. The monomer is a clear liquid with a boiling point of 86.5° C. at 10 mm. and a density of 0.903; it is soluble in hydrocarbons, ethers, and alcohols.

According to Dow Corning, preliminary tests indicated that Syl-Kem 21 may be utilized to prepare new organic polymers with unusual bonding properties and surface characteristics. A 30% copolymer wtih methyl methacrylate, for example, exhibited a coefficient of friction against steel of 0.03, as compared with 0.05 for polytetrafluoroethylene and 0.15 for polystyrene.

Syl-Kem 21 is currently available in pilot plant quantities only.

### Finishing compound eliminates static problem

A scratch-free buffing compound for cutting and coloring plastics, which contains a special ingredient that dissipates static electricity from the finished part, has been announced by Hanson-Van Winkle-Munning Co., Matawan, N. J.

Designated PC-52, the material is said to be especially suitable for acetates, styrenes, and the acrylics, since these softer plastics present the greater static problems. However, the company reports that PC-52 has also given good buffing results on phenolics in initial field installations.

The composition of PC-52 includes a soft abrasive to provide scratch-free cutting and coloring action in a single operation; a built-in lubricant to minimize roll-over or burning problems, particularly when finishing softer plastics; and the specially formulated anti-static agent. The last ingredient is claimed to eliminate a processing step at many installations. After buffing, a thermoplastic part will normally attract pieces of lint, dust, etc. This charge must be removed by immersing the part in a destaticizing solution.

The firm reports that antistatic properties imparted to a part by PC-52 will be retained through an extensive series of subsequent handling operations. The new compound is also said to provide a clear, unclouded finish.

### Barrier coating for films

Saran-based lacquers produced by Pyroxylin Products, Inc. Chicago, Ill., are claimed to improve grease resistance as well as water and gas impermeability of acetate, polyester, and polyethylene films. In most cases, they can be used on existing film and paper coating equipment.

### Keeps powder dry

Virtually moisture-free Plaskon nylon molding compound ready to use directly from its shipping container is now available from Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York, N. Y. This is possible because of the use of a new can, available in 25-lb. size, which is filled in an inert atmosphere and then hermetically sealed. According to Barrett, this method of packaging eliminates the in-process drying operation customarily necessary with conventionally packaged nylon.

Using a different approach, but getting essentially the same result, Rohm & Haas Co., Philadelphia, Pa., has adopted a 3-mil heat-sealed polyethylene film

THE MARK OF QUALITY

BARBER COLMAN

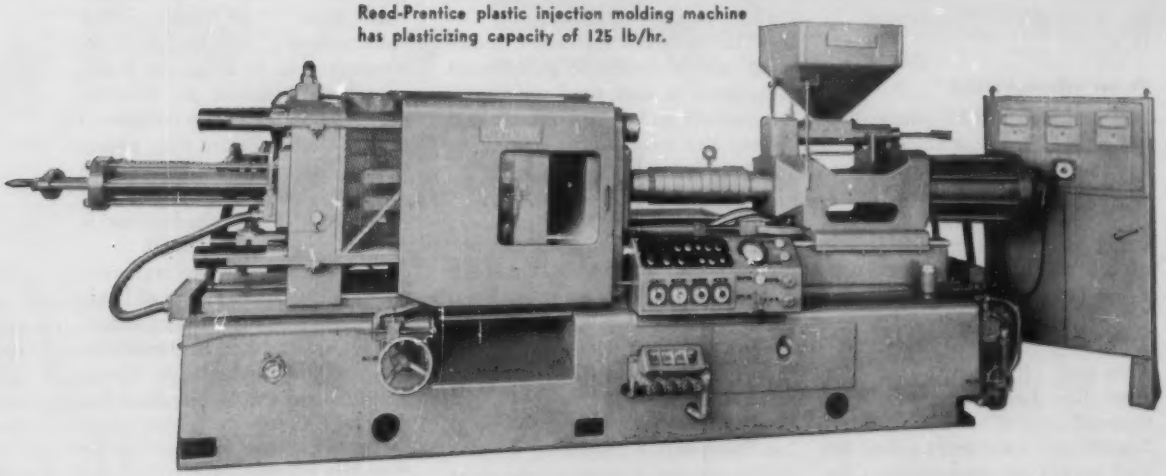
Wheelco Instruments

**Faster, more thorough plasticizing puts premium on precise temperature control**

Because this Reed-Prentice 12/16 ounce plastic injection molding machine is capable of up to 360 cycles per hour, plasticizing must be both fast and precise. To plasticize 125 pounds of material per hour, the machine is designed with a tapered spreader that creates a mulling action, assuring thorough plasticizing of all thermoplastic materials and accurate, 3-zone temperature control for the heating cylinder.

Wheelco proportioning-type Capacitrols were selected by Reed-Prentice to insure accurate, dependable operation. Whether instruments are mounted in a cabinet provided by the manufacturer like this one, or a complete control center is designed and built by Wheelco, you still get the benefit of the thorough engineering that characterizes every Barber-Colman installation — large or small. Learn how Wheelco advanced-design features reduce downtime and simplify inspection or maintenance by writing today for your copy of Bulletin F-6485, "Capacitrols for the Plastics Industry"!

Reed-Prentice plastic injection molding machine has plasticizing capacity of 125 lb/hr.



BARBER-COLMAN COMPANY

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BARBER-COLMAN of CANADA, Ltd., Dept. T, Toronto and Montreal, Canada

# The Plastiscope

liner to minimize moisture pick-up and contamination during shipment of 1000-lb. bulk containers of Plexiglas acrylic molding powder. A similar gusseted continuous-roll liner is used for 200-lb. drums.

### Reinforced Standard on the way

A Recommended Commercial Standard for Glass-Fiber Reinforced Corrugated Structural Plastics Panels (TS-5358) has been presented to the industry for acceptance, according to the Commodity Standards Div. of the U. S. Department of Commerce.

The specification was developed jointly by the Fiberglass Reinforced Panel Council of The Society of the Plastics Industry, Inc. and the Plastics Section of the National Bureau of Standards.

Requirements and methods of test for bearing load, transverse load, flammability, appearance, and color uniformity are included among others.

Copies may be obtained from F. W. Reynolds, Commodity Standards Div., U. S. Department of Commerce, Washington 25, D. C.

### Foam intermediate

High-purity *meta*toluylene diamine (MTD) is now being offered by Aceto Chemical Co., Inc., 40-40 Lawrence St., Flushing, N. Y. One of the applications of the chemical is as an intermediate in the manufacture of polyurethane resins.

### Vinyl for concrete panels

Thin-gage (0.004 to 0.006 in.) vinyl film has proved the most successful material for use when fabricating reinforced concrete wall panels on construction sites, according to a report by Lewis C. Bowers & Sons, Inc., New Jersey builders.

These panels, weighing from 7 to 15 tons each, are made on the construction site at the same time as the steel frame of the building is erected, allowing close coordination of construction schedules; they are stacked for curing before they are attached to the building, which prevents cracking.

One of the major problems encountered in this technique is the method of separating the stacked panels. Prior to the switch to vinyl film, three other separators were tried—a styrene-type sheet, muslin, and water-soluble wax. The first was too brittle; muslin had to be sewn and left an unsatisfactory surface on the panel; and the action of wax was not sufficiently positive.

The advantages of vinyl are that it produces the desired finish, prevents panels from adhering to each other, and is sufficiently low in cost to be expendable.

### Non-toxic pearlescent

Production of a new synthetic pearlescent pigment which does not contain lead and is said to be non-toxic for all practical purposes has been announced by Rona Laboratories, Inc., Bayonne, N. J.

The company foresees a growing use of synthetic pearlescent pigments in toys, food containers, household and personal items, and drug and cosmetic packaging as a result of this development.

### Plastisols for molding

Two plastisol formulations, applicable to either rotational or slush molding operations and based on Pliovic AO and Pliovic S70, have been developed by the Chemical Div. of The Goodyear Tire & Rubber Co., Inc.

In rotational molding, the mold is filled with a measured amount of compound that is just the right amount for the molded item. In slush molding, the mold is filled and the surplus poured out after a skin is formed to the shape of the mold. Rotational molding allows accurate weight control of molded products, reduces plastisol contamination, and provides a clean production operation.

Pliovic AO, a vinyl dispersion, and Pliovic S70, a recently developed medium viscosity resin, are used in equal quantities in the formulations. Use of a relatively small amount of plasticizer in these resin combinations furnishes excellent hardness in finished products. A wide range of color, gloss, and hardness properties may be obtained by varying the formulations slightly.

### Nylon for electrical applications

Superior electric properties and low water absorption are claimed for a new nylon recently added to its line by National Vulcanized Fibre Co., Wilmington, Del. Designated National Nylon Grade 31, the material is available in extruded rods and fabricated parts. Rods are offered in diameters from ¼ through 2 in. and lengths from 3 to 6 feet. With the addition of this new material, the company now offers both grades of nylon covered by MIL-P-17091-B.

Applications for Grade 31 include cams, gears, bushings, nuts, and washers on instruments, radios, television, and other electrical equipment.

### Trade fair in Holland

The first Netherlands plastics trade show, to be known as the "Macroplastic," will be held from November 13 to 20 in the R.A.I. exhibition building in Amsterdam, Holland. Plastics companies in the United States may obtain further information about the plastics fair from N.V. 't Raedthuys, Tesselschadestraat 5, Amsterdam-West, Holland.

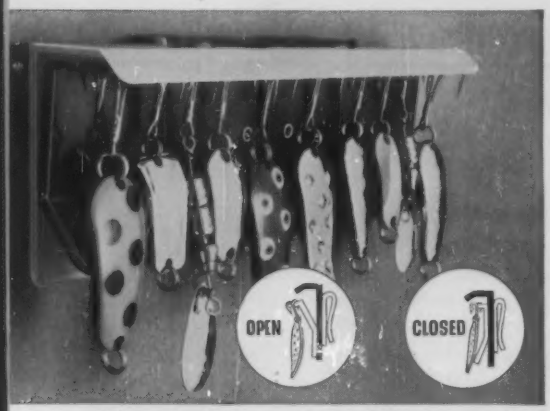
The Macroplastic was organized with the full cooperation of leading persons in the plastics industry in Holland and organizations such as the Netherlands Plastic Institute and the Government Industrial Service.

### New tile adhesives

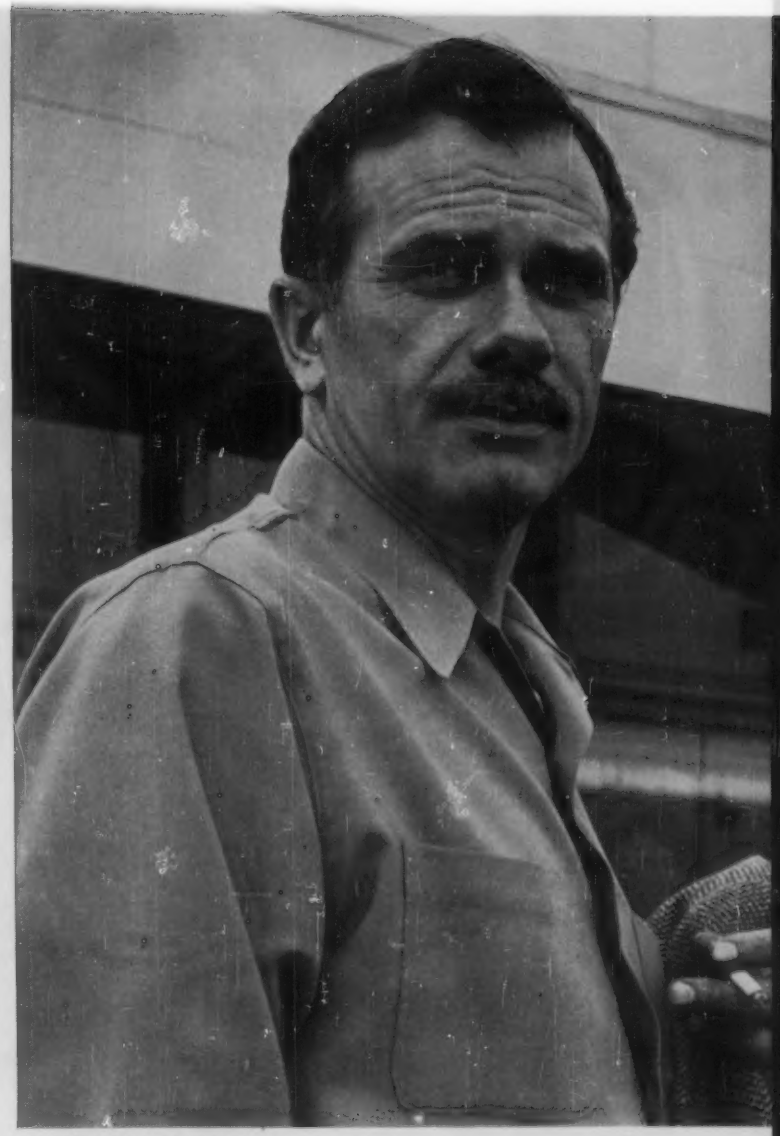
Two mastic cements for plastic and metal wall tile—CMC 44 and CMC 33—have been developed by Chicago Mastic Co., 2300 N. Ashland Ave., Chicago, Ill.

CMC 44, a high-resin oil-base mastic, which the firm claims is

New idea in noncorrosive daubers! Styron provides rigidity for the cap, Dow polyethylene just-right flexibility for the shank. Cap and swab never come loose in use.




New idea in bait racks — winner of a national organization's gold medal award for excellence in design! High-impact Styron makes possible thumb-squeeze, spring action . . . offers delightful color combinations.



**DAVE CHAPMAN, F.A.S.I.D.,** Chicago, speaks his mind.

# Working with ideas: designers and Dow

***Mr. Chapman says, "The industrial designer is a creative planner and thinker, working with ideas . . ."***

New concepts, new applications, new developments become practical when the right material becomes available. Because of this, Dow develops new plastic formulations regularly. Now there are 11 Styron® formulations, making practical many ideas that until recently were infeasible.

***"The industrial designer," Mr. Chapman continues, "is working to produce a better, more attractive product."***

At Dow, designers find invaluable help for achieving this goal. Dow has a wealth of material-to-product know-how and experienced technicians who understand the importance of a close designer-fabricator-supplier relationship.

Whether your problem concerns material, tooling or product application, we invite you to let us help you meet the challenge of today's dynamic plastics industry. Phone your nearest Dow sales office, or write THE DOW CHEMICAL COMPANY, Midland, Michigan — Plastics Sales Department PL1549L.

**America's first family of polystyrenes**

**GENERAL PURPOSE**

STYRON 666
STYRON 665 (Extrusion)
STYRON 688 (Easy Flow)
STYRON 689 (Easy Flow)

**HIGH IMPACT**

STYRON 475
STYRON 777 (Medium Impact)
STYRON 440 (Heat Resistant)
STYRON 480 (Extra High Impact)

**HEAT RESISTANT**

STYRON 683
STYRON 700

YOU CAN DEPEND ON DOW

# The Plastiscope

superior to any competitive mastic on the market, is applicable to both plastic and metal tile. CMC 33, a vinyl-emulsion foundation, is designed for use with plastic tile exclusively.

Prices to jobbers are as follows: CMC 33, $2.15/gal. in 5-gal. containers; CMC 44, $1.68/gal.

### Adhesive for packaging

Lower cost packaging operations are said to be made possible with polyvinyl acetate resin emulsion adhesive E-2131, produced by Paisley Products, Inc., 1770 S. Canalport Ave., Chicago, Ill. Designed for high-speed case and carton sealing, the new emulsion is reported to be miscible with any borated alkaline dextrine adhesive without causing balling-up or congealing, and can be added to glueboxes without need for the complete clean-up of the dextrine adhesive that may have been used previously. Thus, a packager can switch to the resin adhesive without shutting down the machine.

The new adhesive, which is used cold, has a delivered viscosity of 2100 cp. and can be applied by roll, transfer, pickup, extrusion, or spray in high-speed sealing equipment.

### Offers PVAc solutions

Full-scale production of a wide range of vinyl acetate solutions has been started by Cellofilm Industries, Inc., Woodridge, N. J. The company has been known for many years as a leading producer of nitrocellulose-base solutions. Its vinyl acetate production will be offered to users who in the past had to cut their own. Shawinigan resins will be used exclusively.

### Polyester combines impact and flexure

Limited commercial quantities of a new polyester resin, Hetron 33, are now available from Durez Plastics Div., Hooker Electrochemical Co., N. Tonawanda, N. Y. The material is a medium-viscosity, semi-rigid type polyester recommended for use with fibrous glass where good impact and flexural strengths are required in combination.

The price of the material is 39¢/lb. delivered in truckload lots; this is about 13% less than the Hetron 32A resin with whose physical properties the new product is said to compare favorably.

The company recommends Hetron 33 especially for matched die molding. Laminates made from it are claimed to be strong and stiff, to resist impact cracking, and, in addition, to be self-extinguishing. Tests made by Durez indicate that such laminates can be baked at 350° F. for 90 min. several times without crazing or cracking.

### Vinyl-nylon for summer furniture

A new lamination of special formulation nylon and Ultron vinyl film is now being produced by Cohn-Hall-Marx Co., New York, N. Y., for use on outdoor furniture. Designated Nylonite, the material is said to be weatherproof and is intended for upholstery, table cloths, cushions, sun umbrellas, and the like.

According to Monsanto, producer of the Ultron film, Nylonite takes the sun's rays better than any other similar material; it is resilient and resists cracking, mildew, peeling, and soil.

### Radiation for sale

Industrial and academic organizations interested in radiation processing can now use a 10 million-e.v. linear accelerator on a rental basis. The service has been made available at its Western Service Irradiation Center by Applied Radiation Corp., Walnut Creek, Calif.

The accelerator generates high-energy electrons, X-rays, or neutrons and has an electron beam equivalent to 140,000 curies of cobalt-60. Among current users, according to Arco, are M. W. Kellogg Co. (studying the effect of radiation on hydrocarbon systems), Stauffer Chemical Co. (investigating radiation catalysis of organic systems), Hewlett-Packard (limited commercial radiation processing of polyethylene components of electronic test equipment), and others.

### Low-pressure polyethylene tubing from stock

Extruded low-pressure-processed polyethylene tubing is now available from stock in 100-ft. coils from American Agile Corp., Maple Heights (Cleveland), Ohio. The tubing is offered in a range ¼ through 1 in. O.D., with 1/16-in. walls, to ¾ and 1 in. O.D. with 3/32 in.-walls.

### Decorative glass mats

A line of decorative fibrous glass mats is now available from Famco, Inc., Louisville, Ky. The mats are made with continuous glass strands and are furnished with metallic or cotton thread woven as an integral part of the design.

Suggested applications include luggage, lamp shades, counter tops, corrugated paneling, light diffusers, wall coverings, etc.

Mats are available in standard widths of 42, 48, and 60 in. in rolls 110 ft. long.

### New source for Teflon rod

Extruded and molded Teflon rods in a variety of diameters have been introduced by The United States Gasket Co., Camden, N. J. Plastics Div. of The Garlock Packing Co., for use by fabricators of machined parts.

The extruded rod is available unground or centerless ground. Diameters from 0.200 to 2 in. in the unground rod and from 0.200 to 1 in. in the centerless ground rod are currently stocked, with facilities available for special diameter sizes.

### Low-odor, non-toxic coating

A vinyl-emulsion enamel coating, claimed to be non-flammable during application and fire resistant when dry, has been developed by Wooster Finishes Corp., Wooster, Ohio. The coating can thus be safely applied to machinery without interruption of work schedules. In addition, it is said to

Hazen color test on 3 monomeric low-temperature plasticizers, made with 3 different dibasic acids esterified with the same alcohol, shows U.S.I. Isosebacic® acid results in lightest color product. It is a synthetic; whereas the other intermediates are derived from vegetable and animal oils.

*U.S.I. Isosebacic acid yields*

# LOW TEMP VINYL PLASTICIZER... LOW IN COLOR...LOW IN COST

U.S.I. ISOSEBACIC® acid is a new dibasic acid with an unusual combination of properties that provide plasticizers with marked advantages for the vinyl processor.

Esters of Isosebacic acid—

- are very low in color and odor
- impart excellent low-temperature flexibility
- have very low volatility characteristics

Doubly important, when margins are tight, but quality must be high, U.S.I. Isosebacic acid will soon be available at prices that make for sizable savings.

Isosebacic acid is a mixture of three $C_{10}$ dibasic acids — 2-ethyl suberic acid, 2,5-diethyl adipic acid and sebacic acid.

## PHYSICAL PROPERTIES

| | |
|---|---|
| Molecular weight | 202.24 |
| Combining weight | 101.12 |
| Density (80°C) | 1.025g/ml |
| | 8.55#/gal |
| Melt viscosity (80°C) | 78.5 centipoises |
| Specific heat of vapor (226°C) | 0.34 cal/g (est.) |
| Heat of vaporization (226°C) | 107 cal/g |
| Specific heat of solid (24°C) | 0.33 cal/g |
| Heat of combustion | 1296 K cal/mole |
| Flash point (closed cup) | 430°F |
| Ionization constant at 25°C | $K_1 = 3.5 \times 10^{-5}$ |
| | $K_2 = 5.1 \times 10^{-6}$ |

## CHEMICAL PROPERTIES

1. Undergoes typical reactions of the dibasic acids.
2. Reacts with alcohols to yield both acid and neutral esters.
3. Reacts with basic materials to give acid and neutral salts.
4. Relatively stable material, not oxidized by air at ordinary temperatures.

If you produce vinyl plasticizers, polyurethane foams, polyamides, polyester or alkyd resins—send for a sample of U.S.I. Isosebacic acid, and see how it will help you improve performance and lower cost. Call or write for technical data and assistance.

**U.S.I. INDUSTRIAL CHEMICALS CO.**
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N. Y.
*Branches in principal cities*

# The Plastiscope

possess a non-offensive, non-toxic odor that is not noticeable to workmen in adjoining areas, and to have a hard, glossy finish.

The enamel can be applied by roller, dries to the touch in 1 hr., and is dust-free in 4 hours. It is available in seven colors in 1-gal. cans, 5-gal. pails, and 55-gal. drums.

### Speeds adhesives delivery

A new distribution pattern for seven adhesives marketed by Formica Corp. is expected to trim the time required to fill adhesives orders by up to two weeks. Under the new plan, adhesives orders, formerly processed through Formica's Cincinnati headquarters, will go directly to the warehouse nearest the customer.

Products affected by the new policy include Urac 185, Fast Dry Contact Bond Cement, Contact Bond Cement, Fast Dry Solvent, Spray Mix, Urea Glue, and Seamfil.

### Another Teflon-glass tape

Pressure-sensitive Teflon-impregnated fibrous glass tapes are now available from The Connecticut Hard Rubber Co., New Haven, Conn. Designated Temp-R-Tape TG, the product is suggested for use on packaging, converting, and textile machines to reduce sticking, build-up, wear, and friction. The tape has a service temperature range from −100 to 400° F.

Temp-R-Tape TG is available from stock in 12-yd. rolls, 10 mils thick, in ½-, ¾-, 1-, 1½- and 2-in. widths, and by the lineal yard 12 in. wide.

### Pressure-sensitive Mylar tapes

An embossed laminate of metallized Mylar and adhesive-backed vinyl is now available in tape form, under the name Mirro-Brite, from Coating Products, Inc., Englewood, N. J. Metallic colors currently offered include chrome, gold, copper, red, green, and blue. They are deposited on the side of the Mylar which is laminated to the vinyl and are thus protected against scuffing, staining, or scratching.

Mirro-Brite tapes are marketed in 100-yd. rolls in standard widths from ⅝ to 1 in., and may be obtained even wider if desired.

The company expects to announce soon the introduction of a dispenser which will cut the tape to desired lengths and automatically peel away the paper backing that masks the pressure-sensitive adhesive.

### Custom molding of epoxies

Facilities for compression and transfer molding of epoxy parts on a custom basis have been made available by Epoxy Products, Inc., a Div. of Jos. Waldman & Sons, 137 Coit St., Irvington, N. J. Products which the company expects to mold include connectors, electronic embedments, impellers and housings, pipe fittings, disk pistons for meters, coil forms, slip rings, spacers, metal forming dies, pump components, stators, small parts for electronic miniaturization, etc.

The engineering staff will be available to aid in product design and selection of the correct epoxy compound for application requirements.

### New source for polyester-glass panels

Flat translucent sheets of reinforced plastics in sizes ranging from standard sash to 48 by 96 in. are offered by Strick Plastics Corp., Perkasie, Pa. The sheets are press molded from 3-oz. glass mat and polyester resin and will be marketed under the name of Glazor.

Available in a range of colors, Glazor is suggested by the manufacturer for use in skylights, greenhouses, sidewalls, canopies, factory windows, partitions, outdoor signs, door hoods, shower stalls, and other applications. Strick asserts that Glazor will support 100 lb./sq. ft. on a 4-ft. span and can be made flame-resistant by the use of self-extinguishing resin.

The company also markets a corrugated sheet reinforced with 2-oz. mat under the name of Daycor.

### To make machinery for molding vinyl plastisol

Mercury Molding Machinery, Inc., 972 Nepperhan Ave., Yonkers, N. Y., has been formed by Mercury Industries, Inc., Hillsdale, N. J., to engage in the manufacture of rotational and slush molding equipment for the vinyl plastisol industry. Thomas M. Dodds, as vice president, will head the operating staff of the new firm. Charles Szentkuti is chief engineer and factory manager.

Mercury Industries, through its Vinyl Plastics Equipment Div., will produce auxiliary equipment for plastisol molding, including dispensing units, conveyorized ovens, cooling systems, spinning equipment, stripping tables, etc.

### Decorative epoxy panels

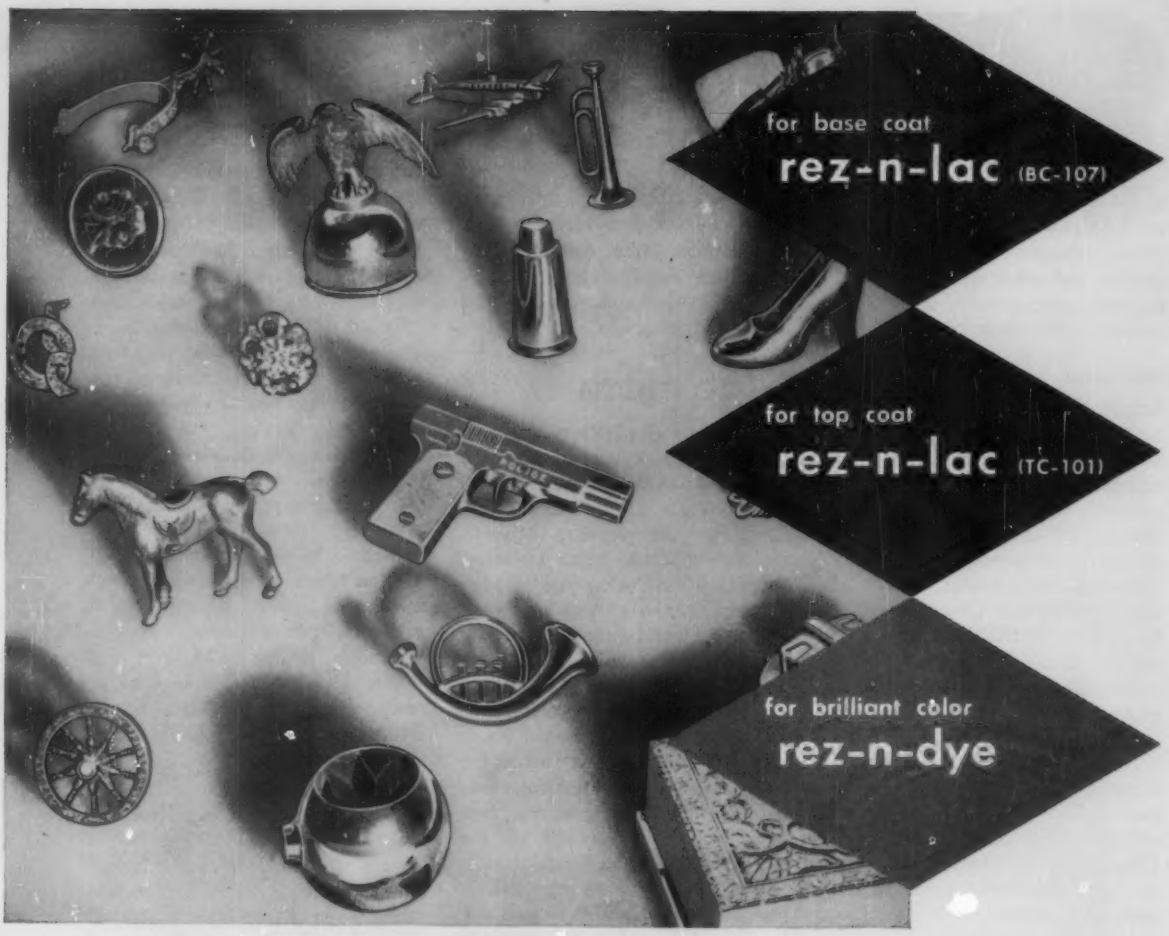
Epoxy-based cast decorative panels (not laminates) have been developed by Hanley Plastics Co., Div. of Wallace Pencil Co., 2001 S. Hanley Rd., St. Louis, Mo. Reflective glitter can be embedded during the manufacturing process for heightened impact. The firm states that the panels are warp-free and that almost any transparent or opaque color can be matched.

Standard size is 4 by 4 ft. by ⅜ in.; larger custom sizes are available on special order. Weight is approximately 2.2 lb./sq. ft. at ⅜-in. thickness. Price for that thickness is $3.75 a sq. ft.

### Flame-retardant epoxy-glass

Self-extinguishing glass-epoxy laminates said to withstand continuous use at temperatures up to 300° F. have been introduced by Continental-Diamond Fibre Corp., Newark, Del. They are available in sheets ranging in thickness from 0.10 to 1 in., plain for power applications and metal-clad for printed circuitry.

Applications include switchgear components (circuit breaker arms, flash guards, and insulating barriers); panels, sub-panels, ter-

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## *quality metallizers turn to Schwartz*

For over a decade, metallizers the world over have turned to Schwartz Chemical Co. for technical advice and quality materials in the production of a multiplicity of consumer and industrial products.

Supplying the 3 basic needs of any metallizer, the base-coat, top-coat and Rez-N-Dye, Schwartz products have become standards in the industry.

Base-coat (Rez-N-Lac BC-107), top-coat (Rez-N-Lac TC-101) and Rez-N-Dye are all any metallizer needs to produce a finished article in a range of colors that covers practically the entire visible spectrum.

For trouble free metallizing, for prompt service and superior materials—one order form will bring all 3 to your plant—and they will be shipped by a manufacturer with a reputation for integrity since the inception of the industry itself.

Schwartz technicians are always at your service to aid you with any problems that may arise. They will be happy to serve you at any time. A letter or phone call is all that is necessary.

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**Manufacturers of Dyes — Lacquers — Cleaners and Cements for Plastics**

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minal boards, and other related power equipment; radio and television relays; printed circuit panels; and other electronic components requiring self-extinguishing characteristics.

**Increases whiteness**

Brightness and whiteness of products made from polyethylene, styrene, vinyl, acetate, and other plastics are claimed to be improved with the addition of Tinopal PCRP, a colorless fluorescent agent produced by Geigy Industrial Chemicals, Div. of Geigy Chemical Corp., Ardsley, N. Y. Tinopal PCRP converts invisible ultra-violet radiation into visible bluish light which acts to mask yellowing.

Tinopal PCRP comes in powdered form and is added to the material prior to milling or mixing; it can also be added in solution. Price is $7.50 per pound. Geigy states that to its knowledge the material is not incompatible with any plastic.

**For temporary molds**

An inorganic, water-mixable casting compound for the production of experimental and short-run molds has been introduced by Versa Chemical Co., 507 Fifth Ave., New York, N. Y. Designated Versament 177, the material is said to have no harmful effects on plastics, rubber, and metal, and to be unaffected by the heat cycles and chemicals encountered in such work. Molds produced from Versament 177 are suitable for vacuum forming, laminating, and other low-pressure molding operations.

## Plasticizer news

**Admex 711 gets FDA O.K.** Approval of Admex 711 for use in vinyl film and tubing for wrapping and handling foods has been given by the Food and Drug Administration. Admex 711 is a primary epoxy plasticizer developed by Archer-Daniels-Midland Co., Minneapolis, Minn. Admex 710, a plasticizer closely related to Admex 711, was approved by the FDA some time ago.

## Pipe note

**Diversifies with plastic pipe.** Entry into the polyethylene plastic pipe field has been announced by Evans Pipe Co., Uhrichsville, Ohio, for over 50 years active in the clay pipe and brick business. Evanite Plastic Co., plastic pipe division of the parent company, will manufacture the plastic pipe at a recently purchased 20,000-sq. ft. plant at Carrollton, Ohio.

Evanite pipe will be available in two types—#1 for potable water and food products use and #2 for water, waste, and chemical service. Evanite #1 is manufactured from material approved by the National Sanitation Foundation.

Both types will be produced in diameters from ½ to 6 in. and will be manufactured in Schedule 40 standard wall and in 75-lb. working pressure types. The firm states that the polyethylene used in its pipe is compounded to resist slit-holing and stress corrosion cracking.

## Expansion

**Air Reduction Corp.,** New York, N. Y., has broken ground at its Murray Hill, N. J., research facilities for the construction of a new 2-story wing to house a considerably expanded polymer laboratory. The new wing is expected to be completed by the end of 1957 and will be devoted to the development of polymers, primarily for paints, adhesives, plastics, and coatings. Chemical research and engineering activities of the laboratory are currently concentrated in five fields: fine organic chemicals, primary intermediates for plastics and resins, polymer research, applications research, and analysis. Work ranges from primary research to pilot plant production.

The expanded facilities are a direct outgrowth of Airco's entry into the chemical fields which started in 1951 with the formation of **Air Reduction Chemical Co. Div.,** formed to produce acetylenic alcohols and glycols. Since then, Airco has completed construction of a calcium carbide and acetylene generating plant at Calvert City, Ky., as well as a vinyl acetate monomer plant in the same area. Two more plants are currently under construction at Calvert City, one to produce methyl butyral (a stabilizer for chlorinated organic compounds, solvents, and intermediates) and the other to manufacture vinyl stearate. In 1954, Airco acquired **Colton Chemical Co.,** producer of synthetic resins derived from vinyl acetate monomer. Among products made by Colton are PVAc emulsions, PVAc copolymer emulsions, PVAc beads, PVA, urea-formaldehyde foam, and Microballoons.

**Witco Chemical Co.** has opened a new plant for the production of raw materials for urethane foams. The new installation, located at the company's **Emulsol Chemical Div.** plant in Chicago, is expected to more than double present capacity for Fomrez polyesters which are used to produce flexible urethane foams.

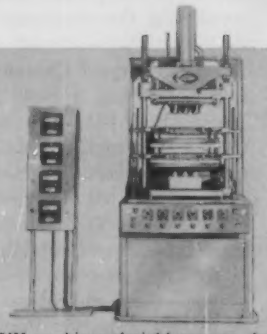
Witco does not produce urethane foams and does not plan to enter the field but is specializing in the preparation of chemicals for them. Included among these are Fomrez 50 and Witco 77-86, a coupler which helps to form uniform foams. Future plans of the company call for production of raw materials for rigid urethanes as well as a hydrophylic (having an affinity for water) polyester.

The company also announces the formation of **Witco Chemical Co., Canada, Ltd.** to manufacture and sell basic industrial chemicals throughout Canada. Initial sales will be in chemicals for the plastics, paint, rubber, and allied industries.

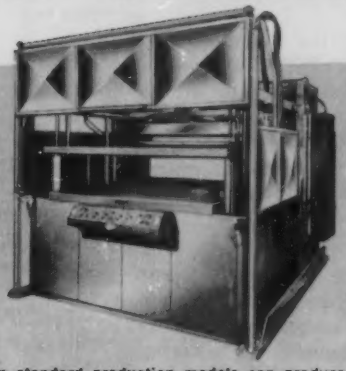
Witco plans to open a Toronto office soon and has already acquired approximately 6 acres of land in Trafalgar Township,

**MODELS FOR EVERY REQUIREMENT...**

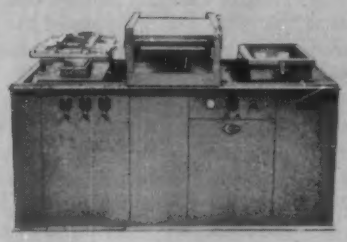
# VacForm automatic and semi-automatic VACUUM FORMING MACHINES



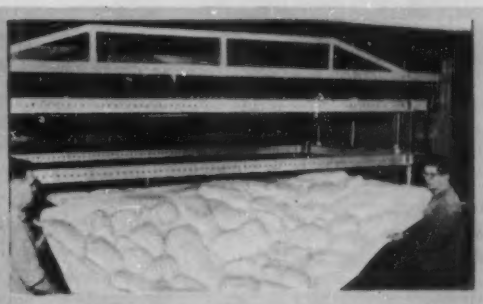
**VAC-TRIM** combines straight vacuum, drape and plug forming—plus automatic trimming—in a single machine. Saves equipment costs, labor, floor space. Push-button operation. Complete flow-control system.



**VacForm standard production models** can produce plastic products ranging from eyeglass cases to refrigerator door panels. Use molds from 2" x 2" to 50" x 74". Bigger sizes can be built to your specifications.



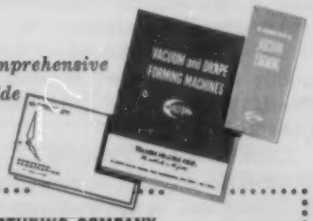
**VacForm 88FM** can be used for research, development, and many commercial applications. It is a low-priced, general purpose forming machine that can be used profitably by smaller manufacturers. This model is also useful to large companies as an experimental unit.



**VacForm "GIANT"** is world's largest vacuum forming unit. This model, engineered and built for National Broadcasting Company, has a forming area 12' long and 6' wide, is used for low-cost three-dimensional TV scenic elements. Comparable models are built to special order for a wide range of special applications.

Choose from an extensive line of VacForm machines for production and research. A pioneer and specialist in vacuum forming, VacForm serves such leading manufacturers as Du Pont, Chrysler, General Electric, Dow Chemical, among many in the appliance, automobile, packaging and plastics industries.

*Write today for comprehensive vacuum forming guide and catalogs.*

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southwest of Toronto, where it will locate a future manufacturing plant.

Officers of the Canadian firm are: **William Wishnick**, who is executive vice president of the parent company, president and treasurer; **S. M. Freeman**, a Witco vice president, executive vice president; and **H. B. Seligman**, vice president.

**Crompton & Knowles Corp.**, Worcester, Mass., announces the formation of a wholly-owned subsidiary, **Knowles Packaging Corp.**, the purchase of the business of **Klear Plastic Products Co.**, Quakertown, Pa., and the acquisition of the **Russell** line of can handling equipment from interests in Plant City, Fla. The management of the new unit also will coordinate the activities of **Wrap-King Corp.**, producer of machines for overwrapping and bundling of products and packages, which was acquired by Crompton & Knowles in 1955.

Headquarters of the new organization will be at Holyoke, Mass. The existing facilities at Holyoke, Plant City, and Quakertown will be augmented by the manufacturing facilities of the parent company at Worcester and Pawtucket, R. I. Sales and Service Depts. will be merged and expanded into a single organization with nationwide facilities.

Crompton & Knowles had earlier acquired **Carl N. Beetle Plastic Corp.** and **Althouse Chemical Co.**

Klear Plastic Products Co., manufactures rigid plastic containers as well as the machines to produce them. These machines pressure-form oriented polystyrene sheet into transparent lids, trays, and containers.

Officers of the company are: **Frederic W. Howe, Jr.**, president; **William W. Anthony, Jr.**, executive vice president and general manager; **Edwin H. Schmitz**, vice president, sales; and **James Barringer**, treasurer. Present operating and management personnel at various plant locations are being retained.

**Monsanto Chemical Co., Plastics Div.**, announces completion of a multi-million dollar expansion of ethylene production facilities at Texas City, Texas. The new facilities, which have been under construction since March 1956, increase the company's ethylene production capacity by 150 percent.

The Texas City plant uses ethylene as an intermediate in the manufacture of polyethylene, styrene monomer, and vinyl chloride monomer. The entire production is used by Monsanto internally.

**Acheson Dispersed Pigments Co.**, a unit of **Acheson Industries, Inc.**, announces the completion of two major plant expansions in Ohio and Texas to meet the increased demand for carbon black dispersions by the polyethylene industry.

In Ohio, Acheson has transferred its operations from the city of Delaware to a larger plant at Xenia. New equipment has been installed for producing concentrated and compounded dispersions in high- and low-density polyethylene and special compounding services will be available. Additional facilities are also being installed for bulk handling and storage. The new plant will be managed by **William R. Edwards**, currently works manager of the Delaware plant.

The expansion at Orange, Texas, is the second for the plant since it was opened in 1955. The Orange plant also produces a line of concentrated dispersions for polyethylene and offers compounding service to manufacturers of polyethylene resins. **Morgan Jones** is plant manager.

**B. F. Goodrich Industrial Products Co.** announces a construction program to provide increased manufacturing and warehousing facilities at its Koroseal plant at Marietta, Ohio. The new building will provide warehousing space to stock coated fabrics, garden hose, and other vinyl products.

The expansion program will also include new production equipment for products presently manufactured at Marietta. It is estimated that 50 new jobs will be created by the expansion.

**Heyden Newport Chemical Corp.** is constructing a new plant at Pensacola, Fla., to produce methyl isopropyl catechol, a new turpentine-based chemical. The new plant, with projected capacity for 500,000 lb., is scheduled for completion in October.

Methyl isopropyl catechol, among other applications, is used as a polymerization inhibitor for polyester resins where the property of modifying viscosity and decreasing gel is important.

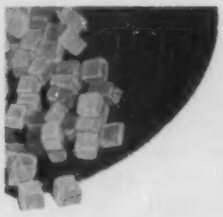
Also under construction at the same site is a plant to produce terpene alcohol esters, including terpinyl acetate and isobornl acetate, used as odorants by the plastics, paint, and rubber industries.

**Canadian Industries, Ltd.**, announces plans to double its polyethylene plant capacity at Edmonton, Alberta, to 40 million lb. annually. Construction is slated to start this year, but no definite completion date has been set.

At the new extension, ethane will be extracted from Alberta natural gas and converted to ethylene, which is then refined to make it suitable for polyethylene production. The original plant went on stream in 1954 and was the first Canadian facility to produce polyethylene.

**Mimosa Corp.** has acquired the hosiery mill of **Julius Kayser & Co.**, Belton, S. C., comprising a one-story plant and about 65 acres of adjoining ground. An additional building with 100,000 sq. ft. of floor space is now being planned.

Mimosa is a new enterprise which was formed to acquire the **Cardinal Div.** of **Hoosier Cardinal Corp.**, Evansville, Ind. Key personnel of the division will be engaged by Mimosa, which plans to concentrate on molded applica-



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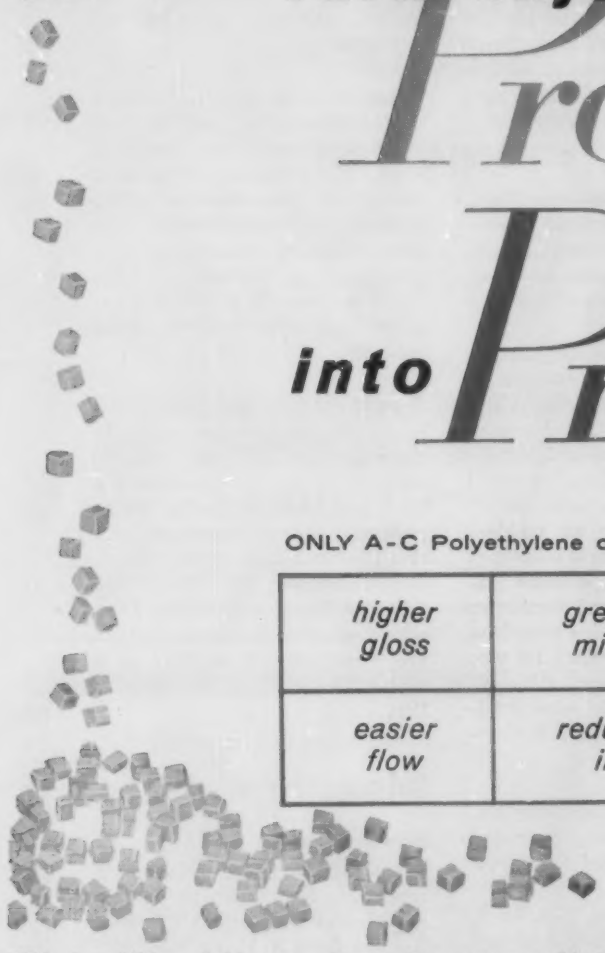
**ONLY A-C Polyethylene offers this unique profit-making combination**

| | | |
|---|---|---|
| *higher gloss* | *greater detail-mirror finish* | *shorter production cycles* |
| *easier flow* | *reduced resins inventory* | *larger molded parts* |



← A-C Polyethylene is now available in convenient, uniform cubes for easy blending. They are reproduced here in actual size.

With the addition of this *one unique resin*, A-C POLYETHYLENE 6, injection molders have found the answer to production and profit problems, from improving production and reducing inventory to molding superior polyethylene parts.

A-C POLYETHYLENE 6 imparts easy flow, combines readily with all molding grades of polyethylene. Added to the normal molding resin, A-C POLYETHYLENE 6 permits the use of mirror-finish molds with no release problems. Result . . . perfectly formed, high gloss parts.

### Shorter Production Cycles

Your equipment can be operated at lower pressures and at shorter cycles.

### Tailor-Made Flow

By varying the percentage of A-C POLYETHYLENE 6 in the base resin, melt index is always under control. You "tailor-make" the flow needed for a wide range of molding applications.

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With the flow characteristics of the molding resin improved, even large or complex molds can be easily filled.

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# The Plastiscope

tions in the textile field (quills, spools, bobbins, pirns, etc.). Mimosa will be headed by **Thomas J. Morton, Jr.** as chairman and **M. B. Robbins** as president. Mr. Morton is president of Hoosier Cardinal Corp. and Mr. Robbins is vice president.

**Celanese Corp. of America** is expanding its chemical terminal facilities at Rock Hill, S. C., to provide storage space and new shipping services for its formaldehyde products and solvents.

Tank truck service on formaldehyde, solvents, and acetic acid will be provided for the company's southeastern district customers, which will enable them to maintain minimum inventories.

**United States Gasket Co.**, Camden, N. J., Plastics Div. of **The Garlock Packing Co.**, is spending $300,000 for new nylon extrusion equipment which will widen the range of sizes of nylon rods, tubes, and special shapes produced by the company.

The firm also plans to expand its Teflon extrusion capacity with the addition of 10 newly designed high-speed Teflon extruders.

**Penn-Plastics Corp.**, Glenside, Pa., has installed the first unit of a planned series of fully automatic compression molding facilities. The new equipment will be housed in an addition to the firm's plant which was completed early this year.

The company is a custom molder doing compression, transfer, and injection molding and epoxy casting.

**The Plastics Div.** of **Imperial Chemical Industries, Ltd.** has acquired approximately 90 acres on the northern outskirts of Darwen, England. I.C.I.'s manufacture in Darwen in the past has been confined to Perspex methacrylate sheet and allied products. The company plans to develop the new site for a wider range of products; the first plant to be erected will probably be for the manufacture of Melinex polyester film, the equivalent of DuPont's Mylar. Later the land may be used for a further extension of Perspex production.

**Tyer Rubber Co., Andover, Mass.**, has acquired control of **Plastimold, Inc.**, Middleport, N. Y., manufacturer of plastic footwear, through an exchange of common stock.

The present operating management of the firm, consisting of **Sydney Porter**, vice president of manufacturing and development, and **Edward H. Goddard**, superintendent and plant engineer, will continue, with the addition of **Philip L. MacLean** as resident manager. Other general officers of Plastimold are: **Wallace E. Brimer**, president and treasurer; **Frank J. Emmett** (vice president, sales, Tyer Rubber Co.) 1st vice president, marketing; **Alan L. Skaith** and **Eric Dent**, vice presidents; and **Gaynor K. Rutherford**, secretary.

**Enbee Transparent Specialty Co., Inc.** has moved its offices and plant from 502 W. 30th St. to new and expanded quarters at 31-35—31st St., Long Island City, N. Y. Enbee fabricates transparent acetate sheeting for such products as photo albums, work ticket holders, loose-leaf protectors, microfilm jackets, and miscellaneous items.

**Plastic Molders Supply Co., Inc.**, has added 5000 sq. ft. of plant space at its home office in Fanwood, N. J. In addition to more equipment for reprocessing plastics, the company has installed a new 13-ton, 50-in., 2-roll mill for making dry polyethylene color concentrates.

**Structural Fibers, Inc.**, formerly located in Bedford, Ohio, has moved into a new building on Fifth Ave., Chardon, Ohio. The company specializes in reinforced plastics; the new plant houses equipment for centrifugal casting, internal pressure molding, matched-die molding, and vacuum bag molding. Products made by the firm include water softener tanks, components for guided missiles, and hospital products.

**Chemtrol Corp.** has moved into a new 10,000-sq. ft. plant at 1417 W. El Segundo Blvd., Compton, Calif. The company produces a line of corrosion-resistant valves made of PVC and Penton, a chloride-containing polymer recently developed by **Hercules Powder Co., Inc.** Capacity of the new facility will be 100,000 units monthly.

**J. B. Carroll Co.** has added 8000 sq. ft. of manufacturing space to its plant at Carroll and Albany Aves., Chicago, Ill. The firm is a fabricator of sheet plastics materials and metal stampings, and manufactures calculators, indicators, computers, etc. Carroll operates a Vacuum Forming Div., where point-of-purchase displays are manufactured, as well as a Thermoplastic Sheet Laminating Div.

## Meetings

### Plastics groups

**September 27:** Society of Plastics Engineers, Inc., Regional Technical Conference, Hotel Niagara, Niagara Falls, N. Y. Subject: "Hot Runner Molding."

**October 8:** Society of Plastics Engineers, Inc., Regional Technical Conference, Curtis Hotel, Minneapolis, Minn. Subject: "Isocyanates."

**October 10-11:** The Society of the Plastics Industry, Inc., Thirteenth Annual New England Section Conference, The Wentworth-by-the-Sea, Portsmouth, N. H.

**October 17:** Society of Plastics Engineers, Inc., Regional Technical Conference, Hotel Carter, Cleveland, Ohio. Subject: "Polyethylene."

**November 11:** Society of Plastics Engineers, Inc., Regional Techni-

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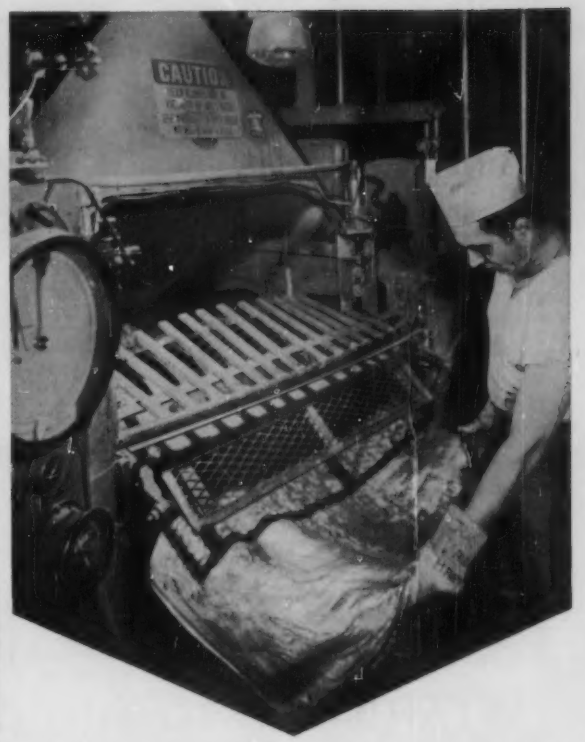

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cal Conference, Ambassador Hotel, Los Angeles, Calif. Subject: "Plastics for Air-Borne Electronics."

**December 10-11:** The Society of the Plastics Industry, Inc., Eighth S.P.I. Film, Sheeting, and Coated Fabrics Division Conference, Commodore Hotel, New York, N. Y.

### Other meetings

**September 15-18:** American Institute of Chemical Engineers, Meeting, Lord Baltimore Hotel, Baltimore, Md.

**September 15-18:** Produce Packaging Association, Seventh Annual Produce Packaging Show and Conference, The Shoreham Hotel, Washington, D. C.

**September 17-18:** Building Research Institute, Meeting of Plastics Study Group, Washington University, St. Louis, Mo. Subject: "Plastic Materials for Roof Construction."

**September 24:** Packaging Association of Canada, Point-of-Purchase and Technical Institute Seminars, Building Centre, Toronto, Ont.

**October 1-3:** United States Army, in cooperation with the Departments of the Navy, Air Force, and Commerce, and the National Security Industrial Association, Third Joint Military-Industry Packaging and Materials Handling Symposium, Fort Lee, Va.

**October 7-8:** Technical Association of the Pulp and Paper Industry, TAPPI Plastics-Paper Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio.

**October 22:** Packaging Association of Canada, Canadian Package Design Council and Technical Institute Seminars, Building Centre, Toronto, Ont.

**October 28-31:** Society of Industrial Packaging and Materials Handling Engineers, National Industrial Packaging and Handling Exposition, Convention Hall, Atlantic City, N. J.

**November 20-22:** American Society for Testing Materials, Meeting of Committee D-20 on Plastics, Cavalier Hotel, Virginia Beach, Va.

# Companies . . . People

**Union Carbide Corp.—Bakelite Co.:** Following appointments made in Advertising and Public Relations Dept.: **A. J. Falconer, Jr.** named assistant general manager; he joined Bakelite in 1951 and served as assistant manager of publicity from 1952 to 1956. **R. W. Matthews,** with the company since 1932, appointed

**A. J. Falconer**

**R. W. Matthews**

manager of the Publicity and Presentations Section; he will be responsible for publicity and press relations, motion picture production, and data gathering for use by the department. **G. W. Crane,** appointed manager of the Advertisements Section, will supervise all national and trade advertisements. **V. J. Pianka** made manager, Art, Printing, and Circulation Sections; **W. J. Connelly,** Market Programs and Public Relations; and **J. F. Lynch,** Technical Writing Section.

**Bruce R. Laumeister** named technical representative for the Extrusion Materials Div. in the Philadelphia district office and **George L. Dougherty** in the Boston district office. Both appointees will be responsible for the sale and service of polyethylene, vinyl, polystyrene, and fluorothene extrusion resins in their respective territories.

**Union Carbide Chemicals Co.: J. B. Harlow,** with the company since 1941, appointed Central Division manager. **Dr. R. I. Hoaglin, A. E. Montagna,** and **Dr. H. W. Schultz** named associate directors of the Development Dept. and **R. M. Berg** appointed administrative assistant to the director at the South Charleston, W. Va., plant.

**Visking Co.: Russell F. Pierce,** with Visking since 1943 and formerly chief engineer of the Plastics Div., promoted to newly created position of operations manager of the division.

**Hercules Powder Co., Inc.:** Name of Missouri Ammonia Works at Louisiana, Mo., changed to **Missouri Chemical Works.** Until the spring of 1954, the facility produced only anhydrous ammonia; since then production has included pentaerythritol and formaldehyde. A new methanol plant also is nearing completion at the site. **Robert W. Crabtree,** with the company since 1934 and formerly manager of nitrogen product sales for the Explosives Dept., named to newly created post of manager of chemical sales. He will be responsible for sales of nitrogen products, methanol, and diversified chemicals.

**The B. F. Goodrich Co.: J. W. Keener,** with the company since 1937 and now executive vice president, elected president, director, and member of the Executive Committee. He succeeds **William S. Richardson** who is retiring after 31 years with BFG. Mr. Richardson will continue as a director of the company.

**B. F. Goodrich Chemical Co.: Dr. Edward N. Learner** named sales representative for general chemicals.

**The Dow Chemical Co.:** The Styrex plant, formerly part of the Styron polystyrene Section, elevated to sectional status, with **A. T. Look** promoted from plant to section superintendent. The Styrex facilities produce Styrex 767, a rigid thermoplastic based on styrene and acrylonitrile. **Harold Bosscher,** formerly superintendent of the Saran Section, advanced to section superintendent in charge of all Styron operations in the Midland Div. He is succeeded by **L. C. Friedrich,** former assistant superintendent of the Saran Section.

**W. R. Grace & Co.—Dewey and Almy Chemical Co. Div.: Edward L. Mears,** with D & A since 1930, appointed to newly created post of general manager of the Container and Chemical Specialties Div. He will supervise sales, research, and manufacturing activities. **Cornelius F. Sullivan, Amos J. Miner,** and **James H. Aungst** appointed sales representatives for the Organic Chemicals Div.

**Air Reduction Co., Inc.—Colton Chemical Co. Div.:** West Coast warehouse facilities established at 3409 Medford St., Los Angeles, Calif., for bulk storage of emulsions for the paint and adhesives industries. Products to be kept in stock include Flexbond 800 copolymer acetate emulsions, Vinol polyvinyl alcohol, Vinac polyvinyl acetate beads, and other polyvinyl acetate products. **Travis V. Rankin,** Colton West Coast district manager is in charge. Assisting him are **Henry George,** technical service representative, and **Stanley Zelewski,** warehouse manager, recently transferred from Cleveland.

**O. & M. Kleemann, Ltd.: Ernest Osborne** appointed a director of **Kleestron Ltd.** Associated with the Kleemann group for 27 years, Mr. Osborne has been general sales manager since 1951 when this company was formed to manufacture polystyrene. **Louis Knepler,** former sales manager of O. & M. Kleemann since 1950, appointed to newly created post of director of overseas relations for the Kleemann group of companies. He is succeeded as general sales manager by **B. Collings,** previously with Selcol, Ltd.

**Radio Receptor Co., Inc.,** including its **Thermatron Div.,** has become affiliated as a subsidiary organization of **General Instrument Corp.** As a result of the re-alignment, it is expected that the Thermatron Div. will further expand the use of its line of dielectric heating equipment.

**Landers Corp.: Charles M. Scholz, Jr.,** formerly with Thermoid Corp., named general sales manager. He succeeds **James L. Davison** who has been appointed to the newly created post of director of sales planning and market analysis. The company manufactures vinyl-coated and processed fabrics for the automotive, furniture, auto trim, and glove trades.

**Skeist & Schwarz Laboratories, Inc.,** 89 Lincoln Park, Newark, N. J., is a new company resulting from the consolidation of their various consulting services. **Dr. E. W. K. Schwarz,** president, is a consultant in fiber development; **Dr. Irving Skeist** is a polymerization specialist.

**The Society of the Plastics Industry, Inc., Midwest Section: W. D. McKay, Keolyn Plastics, Inc.,** Chicago, Ill., elected chairman; **R. A. Becwar, Becwar Mfg. Corp.,** Addison, Ill., vice chairman; **Donald E. Goll, General Molded Products, Inc.,** Des Plaines, Ill., re-elected secretary-treasurer. **W. D. Woodruff, Celanese Corp. of America,** Chicago, Ill., appointed chairman of the Arrangements Committee. Terms expire May 31, 1958.

**Package Machinery Co.** and its subsidiary, **Reed-Prentice Corp.,** have centralized all procurement activities at the Package plant on Chestnut St., E. Longmeadow, Mass., and purchases for both organizations will be handled from there.

**Celanese Corp. of America** has moved its Plastics Sales Dept. from 290 Ferry St. to 744 Broad St., Newark, N. J. All other departments in the Plastics Div. will remain at 290 Ferry St.

**Monsanto Chemical Co.—Plastics Div.: Douglas W. Bannon** now on engineering staff at Springfield, Mass.; **Robert N. Pittilo** named research chemist; **Louis J. Chabot** has joined the Plant Engineering Dept. **Joseph F. Banisch** and **Elwood S.**

(*To page* 240)

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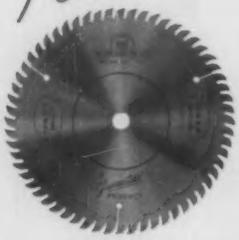

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Not that we really object, mind you. Most of our customers spend pretty leisurely weekends themselves. That's because at Boonton we have a staff of people who do nothing but worry all day—about resins, specifications, cycle selection, mold temperatures, quality control, test runs, inspections, and all the other factors involved in a molding operation. As a result, our modern-type customers don't have to worry at all. They just leave each molding job with us and practically forget about it, until delivery time . . . on schedule, and exactly to specifications.

If you'd like, *you too* can join the trend toward smart, leisurely living. Just let Boonton take care of your compression and injection molding jobs. Then *you'll* be able to relax . . . and smoke cigarettes . . . and polish the car . . . and listen to music . . . and play golf or tennis . . .

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Philadelphia Area—Pioneer 3-0315

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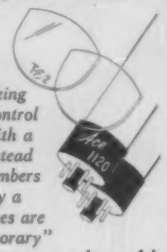
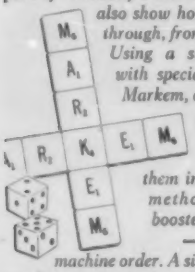


**Seven come eleven, and other games** . . . *like the sporting goods story told here previously, are all part of "industry's marking requirements." They also show how Markem sees the job through, from machine to final mark. Using a standard 25A machine, with special fixtures suggested by Markem, one manufacturer is now printing one side of 15 dice at a time. Compared to leaf stamping them individually, the Markem method has cut costs and boosted output tremendously —resulting in a second machine order. A similar business is running up their score, printing game tiles 132 at a crack with a special 25A. Whether your business is games, drugs, electronics, textiles, shoes or another field — your marking problems have answers at Markem.*



**From Belgium to Brazil** . . . *languages, customs and clothes may be different, but all share a common requirement for identification/decoration marking. Take pharmaceutical houses: in Chicago, New York and other U. S. locations . . . in Panama, Belgium, Brazil, Turkey and other spots around the world, Markem 45AE machines are imprinting batch and date codes on small cartons for drug items. Wherever your business is located, and whatever your marking needs, it may well pay you to see what Markem can offer. Ways to mark products, parts, packages—for decoration, identification or control—have been Markem's business for almost 50 years. Some good answers have been developed in that time—some that probably can help you.*

**When writing, state size, shape, material of item to be marked; rate needed, color requirements, etc. Include sample if possible. This saves time, insures the right machine and method for your job. Markem Machine Co., Keene 20, N. H.**

MARKEM


## Companies . . . People

**Wood III** have joined the Technical Services Dept. at Texas City, Texas. **Earl N. Brasfield, Cecil B. Shelton, Jr.,** and **John M. Schnakenberg** appointed to Production Dept. staff. **Dr. Horace A. Ory** has joined the Research Dept. **Carl R. Perkins, Jr.** now a member of the control laboratory staff. **Edward M. Thomason, Jr.** has joined the Instrumentation Dept.

**Canadian Resins & Chemicals, Ltd.,** Montreal, Que., appointed exclusive sales agent in Canada for **Consolidated Dyestuffs & Chemicals, Ltd.,** Montreal, to handle certain products manufactured by **Badische Anilin & Soda Fabrik, A.G.,** Ludwigshafen a. Rhein, Germany, including Utramid nylon-6 resins.

**American Society for Testing Materials: Richard T. Kropf,** vice president and director of research of **Belding Heminway Co., Inc.,** New York, N. Y., elected president for a one-year term. **F. L. LaQue,** vice president and manager of the Development and Research Div., **International Nickel Co., Inc.,** New York, N. Y., elected vice president for a two-year term.

**Allied Chemical & Dye Corp.—National Aniline Div.: Edward J. Allard,** with the firm since 1931, named resident manager for New England, succeeding **A. E. Sampson,** retired. Mr. Allard was resident manager of the Providence sales branch since 1951. **Michael E. Keane,** with the company since 1921, promoted from senior salesman to assistant resident manager in the Boston sales branch. **Paul J. Sullivan** named resident manager of the Philadelphia sales branch, succeeding **R. Robertson** who will retire.

**Hartig Engine & Machine Co.** has moved from Hillside, N. J., to 1137 Glove Ave., Mountainside, N. J.

**Taylor Fibre Co.: J. A. Royal** named assistant to the vice president—Marketing; **George J. Muller** appointed manager of sales engineering.

**Tumb-L-Matic, Inc.** has moved its office and plant from 4510 Bullard Ave., New York, N. Y., to St. Marys St., Stamford, Conn. The firm makes equipment, compounds, and other supplies used in plastics finishing.

**Acheson Colloids Co., Div. of Acheson Industries, Inc.: Kurt R. Student** and **Connell J. Gallagher** appointed service engineers. Mr. Student will serve the northern Ohio territory out of the Cleveland office, replacing **R. G. Hartnett,** promoted to staff service engineer at the firm's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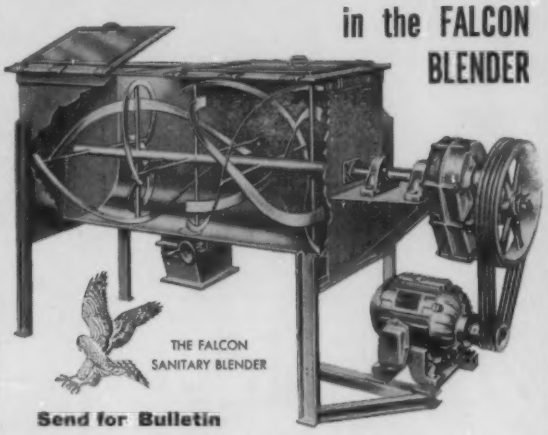


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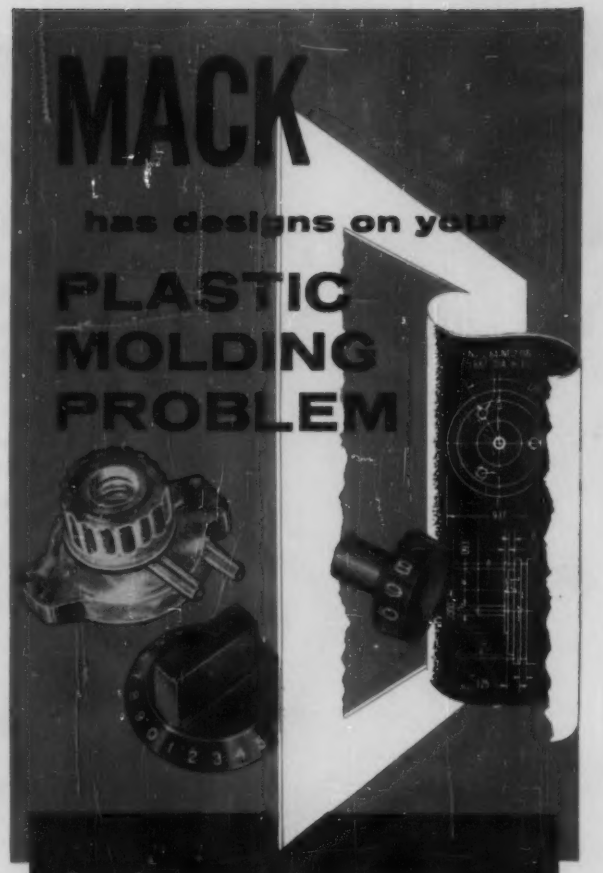

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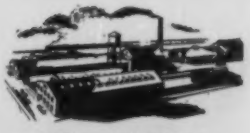

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## Companies... People

headquarters in Port Huron, Mich. Mr. Gallagher, assigned to the Pittsburgh office, will cover western Pennsylvania and W. Virginia.

**Oronite Chemical Co.: W. M. Burge,** former midwestern regional sales manager, named West Coast regional sales manager, San Francisco, Calif. He is succeeded by **H. B. Pollock. T. M. Welton,** formerly Pacific Coast regional sales manager, now eastern sales manager, with headquarters in New York City.

**Isocyanates Products, Inc.,** Wilmington, Del., named exclusive sales and service representative for polyurethane foam machinery manufactured by **Newton Tool & Mfg. Co., Inc.,** Wenonah, N. J. The machinery is designed primarily to meter and mix two-component polyurethane systems.

**Plamo S.p.A.** and **Crinos S.p.A.,** both of Milan, Italy, have opened a joint New York office at 55 W. 42nd St. under the name **Crinoplast, Inc.** Plamo produces hexamethylene diamine, adipates, diisocyanates, and other raw materials for the plastics industry. Crinos produces pharmaceuticals. Crinoplast is directed by **Selim E. Haiat,** vice president.

**Bakol S.A. Industria E. Commercio,** Sao Paulo, Brazil, licensed by **Campco Div., Chicago Molded Products Corp.** to manufacture thermoplastic sheet in a variety of materials, including GM high-gloss styrene. Bakol sells to customers in Brazil, Argentina, France, and Belgium.

**Ware Chemical Corp.,** 80 Myrtle Ave., Westport, Conn., has been organized by **John Ware,** formerly vice president of Kenrich Corp., for the purpose of producing a line of accelerator dispersions and other specialties for the plastics and rubber industries.

**Michigan Oven Co.: Ernest R. Meyers** appointed assistant sales manager; **Graham Barton** named engineering sales representative for the Michigan territory.

**Kish-DeLorme Eastern Resin Sales, Inc., Teaneck, N. J.,** appointed eastern distributor of Pleogen polyester resins produced by **Mol-Rez Div., American Petrochemical Corp.,** Minneapolis, Minn. **George DeLorme** is manager.

**Metalweld, Inc., Protective Coatings Div.,** Philadelphia, Pa., appointed a certified applicator for cementable Teflon produced by **United Gasket Co.** The Teflon lining is applied to

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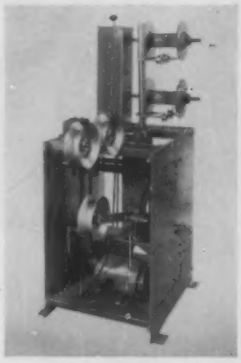

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This unit neatly winds extruded strips such as shoe welting, lacing, tubing, and strip gaskets onto spools. The standard model handles a 12" diameter spool, 12" wide. Adjustable traverse for different width extrusions insures even winding. Diameter build-up is compensated for by dancer rolls which maintain constant linear winding speed and uniform tension. The drive has a speed range from 20 to 1.

Progressive manufactures a wide range of equipment designed for handling the extrusion after it leaves the die. Progressive units are easily adjusted, give years of trouble-free operation, and reduce scrap losses considerably.

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## Companies ... People

hoppers, feeders, chutes, unit containers, and other types of equipment to impart abhesive and abrasionproof surfaces.

**Commercial Plastics & Supply Corp.**, 630 Broadway, New York, N. Y., appointed distributor for **Campco Div., Chicago Molded Products Corp.**, Chicago, Ill., and **Wasco Products, Inc.**, Cambridge, Mass. The company will handle Campco's decorative rubber-modified styrene sheet in New York and Florida; in New York and adjacent territory, it will distribute Wasco's cast Acrylite methacrylate sheet with decorative embedments.

**E. V. Roberts & Associates**, Pacific Coast distributor for **Shell Chemical Corp.**'s epoxy resins, has moved its northern California offices from Redwood City to larger facilities at 1560 Laurel St., San Carlos. The firm handles phenolic adhesives and coatings produced by **Lebec Chemical Corp.**, Paramount, Calif.

**Azienda Lavorazione Colori Resine e Affini**, Milan, Italy, has been licensed by **Archer-Daniels-Midland Co.** to make synthetic resins, copolymers, plasticizers, and foundry core oils and binders based on ADM research and know-how. ALCREA will continue to produce its own line of resins but will use ADM tradenames on many of its new products.

**Westinghouse Electric Corp.: Ronald N. Sampson** and **I. R. Axelrad** named supervising engineers in the Insulation and Chemical Development Section of the Materials Engineering Dept.

**Roger Williams Technical & Economic Services**, Princeton, N. J., has formed a Latin American subsidiary of the same name with offices in Havana, Cuba. The firm will carry out consulting chemical market research and economic studies throughout the Latin American area.

**General Mills, Inc.: Frank J. McNamara**, formerly with Fritzsche Bros., Inc., appointed eastern sales representative for the Chemical Div. He will be responsible for sales of Versamid polyamide resins, fatty nitrogen compounds, fatty acids, fatty methyl esters, and sterols. **Alby Wolf** named to staff of the Chemical Engineering Research Dept.

**Columbian Carbon Co.: W. Raymond Ahrberg**, formerly with Barrett Div., appointed technical salesman for the **Carbon Black and Pigment Div.** at the Akron, Ohio,

Dynamit-Actien-Ges. [illegible] vormals Alfred Nobel & Co., Abt. Venditor Kunststoff-Verkauf Troisdorf/Köln (West Germany)

office. He succeeds **William E. Ford**, transferred to technical service, replacing **Alden H. Davis**, named resident technical service manager in Sao Paolo, Brazil, for **Companhia Petroquimica Brasileira-Copebras**, a joint enterprise of Columbian with **Celanese Corp. of America, Traders, Inc.**, and Brazilian interests.

**Blossom Mfg. Co., Inc.** has moved from 915 Broadway to 292 Fifth Ave., New York, N. Y. The company fabricates vinyl film.

**Latrobe Steel Co.: W. G. Dahl**, with the firm since 1946 and formerly district manager of the Hartford branch office, named eastern regional sales manager. **L. M. Teich**, formerly district manager of the Philadelphia territory, succeeds Mr. Dahl in Hartford. **J. G. Goodrich** promoted to district manager of the Philadelphia branch office.

**Bensing Bros. & Deeney: Robert H. Bensing** named eastern sales manager for the **Flexographic Printing Ink Div. John B. Plunkett**, with the company since 1937, promoted to eastern sales manager and director of purchasing.

**S. W. ("Perk") Jones, Jr.** has joined the Development Dept. of the **FMC Organic Chemicals Div., Food Machinery & Chemical Corp.**, as manager of plastics development. Mr. Jones was formerly with the Chemical Manufacturing Div. of M. W. Kellogg Co. and spent 13 years with the Plastics Div. of Celanese Corp. of America. The FMC Organic Chemicals Div. makes Dapon resin (Diallylphthalate prepolymer) and a complete line of **Ohio-Apex** plasticizers. The division also produces a wide range of methallyl and allyl monomers, as well as phosgene and acetoacetic ester derivatives, and other fine organic chemicals at plants in Baltimore, Md., and Nitro, W.Va.

**S. W. Jones**

**Paul P. Dickes** appointed to the newly created post of controller of **Penn-Plastics Corp.**, Glenside, Pa. **Charles W. Kleiderer**, executive vice president, says that the new position was created to round out company management needed to meet new expansion plans following last year's growth which resulted in doubling the previous year's sales volume.

**Dr. James E. Fearn**, a specialist in physical organic chemistry, has joined the staff of the **National Bureau of Standards**. A member of the **Polymer Structure Section of the Organic and Fibrous Materials Div.**, Dr. Fearn will develop special organic compounds with specific char-

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## Companies... People

acteristics needed in the section's work. The Polymer Structure Section conducts basic research on the constants, properties, constitution, and structure of macromolecular structures. This research is important in the development of standards for polymeric materials and of new and different applications of plastics, fibers, and rubbers.

**Homer S. Myers** elected to newly created post of vice president, Marketing, **Tracerlab, Inc.**, Waltham, Mass., producer of nuclear equipment and instruments. Mr. Myers was one of the founders of the firm and has been general manager of its Industrial Div. The new marketing division will implement Tracerlab's broadened marketing facilities with responsibility for the sale of the company's nuclear and industrial products and services and for marketing services to the X-ray sales effort. In addition, the division is developing a market research program to continue finding new uses and new products in both nuclear and X-ray fields.

H. S. Myers

**Dr. Samuel L. Madorsky**, a physical chemist at the **National Bureau of Standards** was awarded the Dept. of Commerce Silver Medal for Meritorious Service. The award recognizes his "researches which have contributed greatly toward an understanding of the relationship between molecular structure and thermal stability of polymers.

**John Achelis** elected vice president in charge of sales of newly formed **Inso Products, Ltd.**, a wholly owned subsidiary of **Adam Consolidated Industries, Inc.** He will supervise market development of Inso's new process of applying a 2-mil Teflon coating on copper wire. Application for the wire, claimed to have 200% more dielectric strength than conventionally insulated wire, is suggested for magnet wire in motors, lead wire, and hook-up wire.

**Alfred A. Rodick**, formerly chief engineer of Admiral Corp's Molded Products Div., named chief engineer of **G. Felsenthal & Sons, Inc.**, Chicago plastics fabricating and injection molding firm.

**William Demarest**, formerly with National Association of Home Builders, named director, plastics in construction, of **Manufacturing Chemists' Association, Inc.** He will head up an augmented program on plas-


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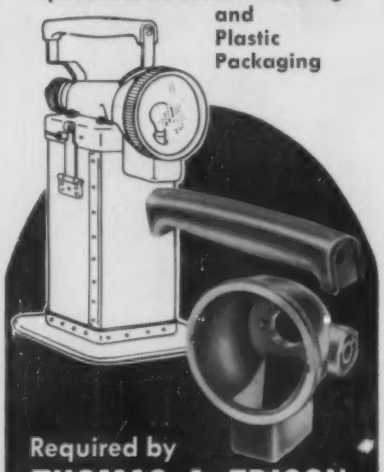

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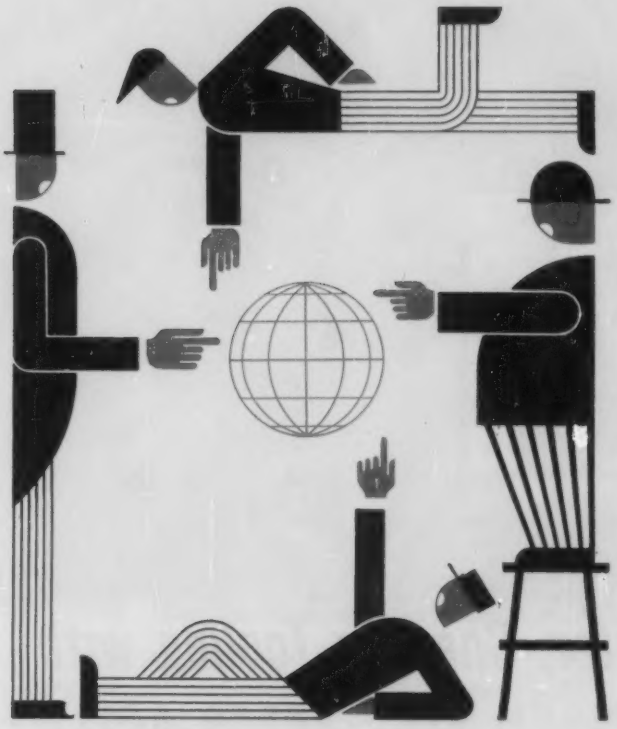

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tics for construction, particularly to promote their use as engineering materials. Mr. Demarest will work with building officials and municipalities in cooperation with S.P.I. in negotiating building code revisions to permit wider use of plastic materials where it is shown they will meet all necessary safety and performance standards. For MCA, he will develop industry-wide programs on behalf of plastic materials manufacturers.

**Herman Muehlstein,** president of **H. Muehlstein & Co., Inc.,** was awarded an honorary **Doctor of Humane Letters Degree** at the University of Akron commencement ceremonies. Mr. Muehlstein's degree was awarded in recognition of his "notable contributions to the welfare of his fellowmen." His many philanthropic activities include **Herman Muehlstein Foundation, Inc.,** a fund for the education of underprivileged youths in the New York area.

**H. Muehlstein**

**Paul E. Willard, Ohio-Apex** research director of **Food Machinery & Chemical Corp.'s FMC Organic Chemicals Div.,** was selected as a representative to the **Plastics Div.** of the **International Organization for Standardization** meeting in Bürgenstock, Switzerland, held from July 7 to July 13.

**S. J. Pappalardo** named merchandising services supervisor of **W. R. Grace & Co.'s Polymer Chemicals Div.** He will be responsible for the activities of the Merchandising Services Dept. which will merchandise consumer products made from Grex high-density polyethylene.

**Gerard W. Kohler** named sales engineer in the New York district office of **Arthur Colton Co.,** Detroit, Mich. He will handle sales of Colton high-speed rotary tabletting equipment, filling machines, tablet press punches and dies, and allied production equipment.

**James W. Simmons** named manager of **H & R Industries,** Nazareth, Pa. The company is an extruder and molder and produces heavy- and light-gage polyethylene sheet. Mr. Simmons previously operated his own sales representatives organization in the industrial plastics field.

**George H. Johnson,** purchasing agent of **Auburn Button Works, Inc.,** Auburn, N. Y., was recently honored at a banquet by fellow employees, busi-

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A unique rubber-resin blend, Naugatuck's Kralastic® is now used in extension-type Curb Boxes and in Cathodic Terminal Boxes*. Why in Curb Boxes? Because Kralastic can't corrode; it permits the telescoping section to collapse when necessary. Why in Cathodic Terminal Boxes? Because Kralastic permitted design changes for more simplified testing. In both instances, the non-corrosive character of Kralastic eliminates the nuisance of hard-to-remove caps.

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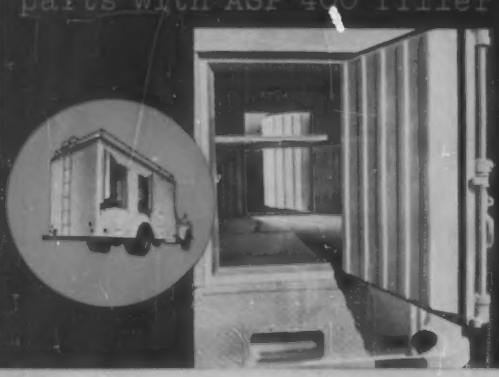

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**Filler Report:** Customer uses high loadings of ASP 400—M & C's Aluminum Silicate Pigment filler—in formulations of epoxy and polyester resins and fiberglas to make roof tops, floors, and doors (including door panels, frames and steps) for bodies like the one shown here. Results:

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## Companies . . . People

ness associates, and friends who joined Mr. Johnson in observing his 50th Anniversary with Auburn. Mr. Johnson, who joined the company in 1907, will continue as head of the Purchasing Dept.

**Andrew L. Pontius** elected a vice president of **Illinois Tool Works,** Chicago, Ill. He will continue as general manager of the company's **Shakeproof Div.,** which produces a line of plastics fastening devices.

**The Haynes Co.,** Tulsa, Okla., appointed exclusive representative in the Tulsa area for **Flexrock Co.,** Philadelphia, Pa., and **General Coated Products Co.,** Elyria, Ohio. Flexrock fabricates Teflon; General Coated specializes in the application of protective coatings, including epoxies, plastisols, phenolics, neoprene, and vinyls.

**John B. Clopton,** formerly sales manager for monomers and raw materials at Monsanto Chemical Co.'s Plastics Div., Texas City, Texas, now with **Escambia Chemical Corp.** He will devote his activities to commercial development and the sales of methanol and ammonia products.

**John J. McDevitt** named vice president of **Lippincott & Margulies,** New York industrial design firm.

**Fred M. Stefan,** formerly with Swedlow Plastics Co., appointed executive vice president of **Borg-Warner Corp's Marbon Chemical Div.** The division produces Cycolac resin, modified styrene, resins for the rubber and paint industries, and rubber-to-metal adhesives.

**C. H. Whitlock Associates,** 21655 Coolidge Highway, Oak Park, Mich., appointed representatives for Automold fully automatic compression molding machines manufactured by **Automatic Molding Machine Co.** Whitlock will cover the eastern half of Michigan, part of Indiana, and Ohio.

**Robert W. Phillips** appointed chief engineer of synthetics and plastics in the Research and Development Div. and elected to the Executive Council of **Flexonics Corp.,** Maywood, Ill.

**Robert E. Burke** appointed manager of the Warren, Pa., plastics plant of **Sylvania Electric Products, Inc.**

**G. Rodney Wick,** named special assistant to director of research of **Dyestuff & Chemical Div., General Aniline & Film Corp.,** will initially act as technical coordinator for the Research Dept. phases of the firm's

new ethylene oxide project at its Linden, N. J., plant. Ethylene oxide is used in the manufacture of ethylene glycol, acrylonitrile, and other chemicals.

**Capitol Glass Co., Inc.**, Springfield, Ohio, and **Wholesale Materials Co.**, Hattiesburg, Miss., appointed new distributors of fibrous glass reinforced plastics panels produced by **Corrolux Div., L.O.F. Glass Fibers Co.**

**E. W. Kaufmann,** Flourtown, Pa., appointed exclusive representative in the Philadelphia area for **The Baker Castor Oil Co.**

**John E. Raven,** formerly with Plastic Center, Inc. and Rohm & Haas Co., now with the Sales Dept. of **J. B. Henriques, Inc.**, 521 Fifth Ave., New York, N. Y., exclusive distributor in the United States for **I.C.I.** Perspex cast methacrylate sheets.

**Ernest G. Campbell,** retired as general superintendent of distribution for The Peoples Gas Light & Coke Co., is now a manufacturer's representative for **Perfex Plastics, Inc.**, Chicago, Ill. The firm supplies plastic pipe and fittings to gas distribution companies.

**Jerome Kurtz** appointed technical service engineer of **Ferro Chemical Corp.**, subsidiary of **Ferro Corp.**, Bedford, Ohio. Mr. Kurtz will furnish technical assistance to users of the firm's polyvinyl chloride resin heat and light stabilizers.

**Bruce S. Phalen** appointed supervisor of the Coating and Solvent Recovery Section of the Coating Dept. at the Marcus Hook, Pa., plant of **American Viscose Corp.'s Film Div.**

**Hugh P. Kelly** appointed New England representative for **Emet Plastics**, 3500 Park Ave., New York, N. Y., thermoplastic sheet former.

**S. F. Long,** with the company 10 years, named manager of the Chicago district sales office of the Silicone Products Dept., **General Electric Co.**

**Elmo International,** 7 Church St., Paterson, N. J., appointed exclusive agent in the United States for **Comerio Ercole S.p.A.**, Busto Arsizio, Italy. The company makes a complete line of machinery for the plastics and rubber industries.

**Richard L. Rouviere** named market extension engineer of **Devcon Corp.**, Danvers, Mass., producer of plastic steel. He will work with Devcon's

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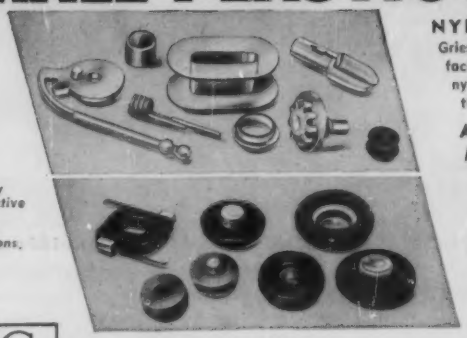

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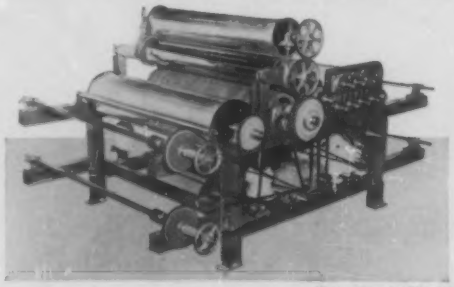

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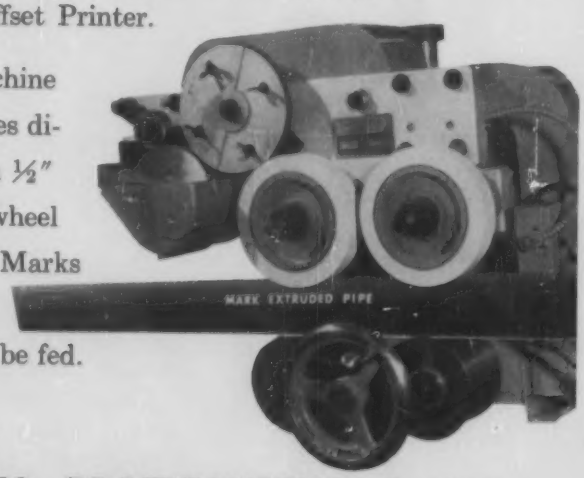
NAMES • CODES • WORKING PRESSURES • WALL THICKNESS
DIMENSION MARKS • N.S.F. APPROVAL

Matthews Offset Printer.

One machine accommodates diameters from ½" to 6" single wheel adjustment. Marks as fast as material can be fed.

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3951 Forbes St. Pittsburgh 13, Pa.

*Offices in Principal Cities*


## Companies... People

industrial supply dealers in bringing newly developed technical applications for the product to industrial plants.

**Dr. John H. Wotiz,** appointed group leader in **Diamond Alkali Co.'s** Exploratory Research Dept. at Painesville, Ohio, will supervise research relating to acetylene chemistry.

**Eric Sheldon** named research chemist in the Chemical Processing Div. of **Auburn Button Works, Inc.,** Auburn, N. Y. The division is largely concerned with industrial use of plastisols.

**William L. Ellslager** has joined the research and development staff of **The Glidden Co.,** Cleveland, Ohio. The firm produces polyesters, coatings, and pigments for the plastics industry.

**Wilson-Rogers, Inc.,** Des Moines, Iowa, **Structural Foams, Inc.,** Cleveland, Ohio, and **Pacific Chemical & Fertilizer Co.,** Honolulu, Hawaii, appointed distributors for Styrofoam expanded polystyrene produced by **The Dow Chemical Co.,** Midland, Mich.

**Arthur W. Rosen** named technical assistant to the plant manager of **Minnesota Mining & Mfg. Co.'s** Bedford Park, Ill., plant; he will supervise reinforced plastics molding operations conducted there.

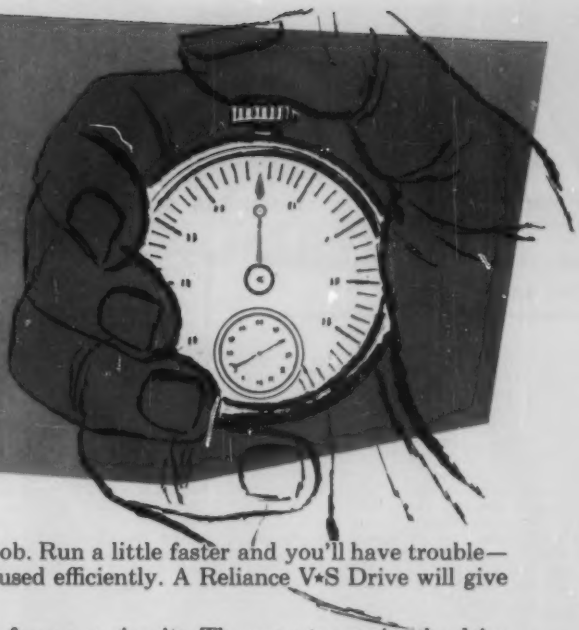
**Carl Seybold,** formerly senior research engineer for the Plastics Dept. of Hughes Aircraft Co., has joined **Radioplane Co.,** Van Nuys, Calif., as an engineer-plastics specialist. He will be concerned with plastics applications in the guided missile and target drone operations of the company.

**William C. Foster,** formerly with Armstrong Cork Co., appointed sales representative of **Mobay Chemical Co.,** St. Louis, Mo. He will be active in marketing urethane chemicals.

**John G. Kearns,** previously with York-Shipley, Inc., appointed production manager of **Lord Chemical Corp.,** York, Pa., manufacturer of equipment and compounds for precision barrel finishing of plastics and metals.

**Frank W. Heidenreich** named plant manager of **Resolite Corp.,** Zelienople, Pa., manufacturer of structural plastic panels. Mr. Heidenreich has been director of research and development for the past five years and will continue in that capacity in addition to his new duties of over-all plant supervision.

# how do you measure your production?



There is a *just-right* production speed for every job. Run a little faster and you'll have trouble—a little slower and your equipment is not being used efficiently. A Reliance V*S Drive will give you the *just-right* speed for each job.

Reliance V*S is an all-electric drive that operates from a-c. circuits. The operator varies the drive motor rpm. to set up the ideal speed for every job. With no rigid set of gear ratios with a limiting number of speeds, he has an infinite selection of rpm.'s from a wide flexible band of operating speeds.

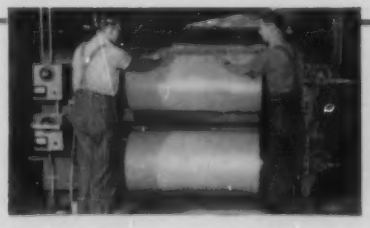
There is a V*S Drive designed for your equipment. Write for Bulletin D-2311.

## • TONS PER HOUR

In order to maintain a uniform production rate of 80 tons per hour with varying sizes of pipe, this pipe mill must change its line speed from 30 ft. per minute to 80 ft. per minute to compensate for differing gauges of steel. A 500 hp. multi-motor V*S Drive does the job.

## • YARDS PER MINUTE

In order to properly size differing types of cotton cloth, the textile slasher must operate at line speeds varying from 28 yds. per minute to 225 yds. per minute. A 25 hp. V*S Drive does the job.



## • REVOLUTIONS PER MINUTE

In order to maintain the correct tension on the metal on this highly accurate rolling mill, the speed of the coil winder must decrease from 900 rpm. to 450 rpm. as the diameter of the roll builds up. A 20 hp. V*S Drive does the job, automatically.

D-1580

**RELIANCE** ELECTRIC AND ENGINEERING CO.

DEPT. 158A, CLEVELAND 17, OHIO • CANADIAN DIVISION: WELLAND, ONTARIO

Sales Offices and Distributors in Principal Cities

# Classified Advertisements

**EMPLOYMENT • BUSINESS OPPORTUNITIES • USED OR RESALE EQUIPMENT**

## Machinery and equipment for sale

**FOR SALE:** 1-Baker Perkins size 15USE, 100 gal. all stainless double arm Vacuum Mixer; 1-Baker Perkins size 15VUMM, 100 gal. double arm Mixer, 100 HP motor; 6-day 250 and 100 gal. double arm Mixers; 1-Ball & Jewell #1 Rotary Cutter; 2-Two Roll Mills 6"x12"; 6-Stokes Model DD2, DS3, D3 and B2 Rotary Preform Presses; 4-Stokes Model "R" single punch Preform presses; 1-Kux Model 15-25 Rotary Preform Press; Also: Sifters, Banbury Mixers, Powder Mixers, etc., partial listing; write for details; we purchase your surplus equipment; Brill Equipment Co., 2407 Third Ave., New York 51, N.Y.

**FOR SALE:** Singer Vinyl Electronic Sealing Machine, cost $2,000, used 3 months, price $1,000 FOB. I-1oz. Van Dorn Injection Molding Machine, used, in good condition. Single or 3 phase motor equipped, $1,300 FOB. Subject to prior sale. MaG-TyE Mfg. Co. Box 1228, St. Albans, W.Va .

**FOR SALE:** Polyethylene film, bag and general plastic extrusion plant for sale, merger or partnership. Latest equipment. Located in east. Reply Box 2526, Modern Plastics.

**FOR SALE:** Cumberland Scrap Grinder #0, 3 HP, late type, reasonable. 200 ton W.S. top Transfer Molding presses, self-cont'd '48 bed 30"x30"; Royle 2" Extruder Perfected #1, hardly used, reasonable. 32-22-16-12-8-6-4-2 oz. Reed, W. Stillman, Lester Injection Molding Machines; Cumberland Dicer 1953; four knife rotor, 15 HP; #9 Standard and Upacting Geared Toggle Press. 4 rod compound; 200 T. 24"x24" platens; with roll feed & excel. Raw Material Mixing Plant; complete for phenolic molding and similar lines, never used, in original crates, cost $250,000; conveyors, premixers, sifters, valves, crushers, scale, blenders, screen, dryer, dust collector, cutters. Will sell all or part. Hydraulic Trimming Press; 50 T; 72"x48" working area; 25"str. 3000#PSI; 10 HP 1150rpm; Vickers pump; good condition. 3½" National Plastic Extruder, Serial 3140 and 3260; good cond. Eveready: Box 638; Bridgeport, Conn. EDison 4-9471—E. J. McCallum.

**FOR SALE:** 2500 ton downstroke 54" x 102". 800 ton laminating press with 23 openings 26" x 38". 500 ton Baldwin downstroke 32" x 36". 300 ton upstroke press 22" x 35". Elmes 200 ton 28" x 28". Farrel 200 ton 30" x 30". 200 ton Hobbing Press 18" x 14". Farrel 200 ton 20" x 50". D & B 140 ton, 36" x 36". French Oil 120 ton self-contained 18" x 22". Adamson 80 ton 20" x 20". Also Lab to 2500 tons from 12" x 12" to 48" x 48" Hydr. Pumps and Accumulators. Stokes Automatic Molding Presses. Van Dorn 1 oz. Injection Molding Machine. Mills and Calenders to 84". New Seco 6" x 13" and 8" x 16" Mixing Mills and Calenders. Plastic and Rubber Extruders. Oxford 57" Slitter. Rotary and single punch Preform Machines, ½" to 4". Injection Molding Machines 1 oz. to 60 oz. Baker-Perkins & Day jacketed mixers. Plastic Grinders. Gas boilers. Partial listing. We buy your surplus machinery. Stein Equipment Co., 107-8th Street, Brooklyn, N.Y.

**LIQUIDATION**
Transfer Molding Presses, late type, self-contained
1—300 ton Stokes
2—200 ton Baldwin-Southwark
2—150 ton Stokes
1—100 ton Stokes
6—Thermall Preheaters.
Reply Box 2519, Modern Plastics.

**FOR SALE:** 1—HPM—16 oz. 1952 Injection Machine Serial No. 51-271 with two Xact line Controls for Wheelco Instruments. 2 spare Pumps and - spare IMS 16 oz. Heating Cylinder. Also 1 Reed-Prentice 12 oz. 1952 Injection Machine Model 10—D12 Serial No. 61531. Both in excellent condition and can be seen at any time. Submit offer—New Plastic Corp., 1026, N. Sycamore, Los Angeles 38, California.

**FOR SALE:** 1 Dunning & Boschert 650 ton hydraulic press, 48" x 36" platens; 1 NRM 3½" oil heated plastics extruder; 1 Ball & Jewell #1 rotary cutter, 15 HP; 1 Farrel 8 x 16"—4 roll calender, complete; 2 Stokes T, RD-4 tablet presses; also mixers, presses, cutters, mills, etc. Chemical & Process Machinery Corp., 52 Ninth St., Brooklyn, N.Y.

**AVAILABLE AT BARGAIN PRICES:** Pneumatic Scale Packaging Unit consisting of Carton Feeder, Bottom Sealer, Top Sealer and Filling Units. Both 30 and 60 per minute. Baker Perkins 50 gallon Steel and Stainless Steel Steam Jacketed Heavy Duty Mixers with Stainless Jacketed Blades, motorized power tilting, motor driven. J. H. Day from 1 qt. to 150 gal., Imperial and Cincinnatus D.A. Jacketed, Sigma Blade Mixers. Day 15 to 10,000 lbs. Dry Powder Mixers. Package Machy. FA, FA2, FA4. Miller, Hayssen, Scandia, Hudson Sharp Wrappers. Mikro Bantam, 1SH, 1F, 2TH, 3TH Pulverizers. Day, Rotex, Tyler-Hum-mer, Great Western Sifters. Complete details and quotations promptly submitted Union Standard Equipment Co., 318-322 Lafayette St., New York 12, N.Y.

**FOR SALE:** (6) 100 ton., 10" ram, 10" stroke @ $1250; (7) 200 ton. 9" stroke, 14" ram, 36x36, @ $2150; (6) 200 ton, 9" stroke, 15" ram, 30x30 @ $1850; (1) ton complete, 18x18 @ $1850; (1) 200 ton 16" ram, 30x30 @ $2450; (2) 200 ton 16" ram, 42x42 @ $2850; (1) 200 ton, 15" ram, 42x42 @ $2600; (3) 250 ton (2) 12" ram, 30x60 rebuilt @ $3675. Hydraulic Sal-Press Co., Inc., 386-90 Warren Street, Bklyn, N.Y.

**FOR SALE:** Surplus equipment—Injection Molding Machines up to 60 oz.—Compression Molding Presses—50 ton 12" x 12" Laboratory Presses—Carver Laboratory Presses rebuilt and guaranteed—6" x 13" Laboratory Mills—¾" Double Solenoid Control Valves 3000 psi—Partial List—Send us your inquiries. Plastic Machinery Exchange, 426 Essex Avenue, Boonton, N. J.—Telephone DEerfield 4-1615.

**FOR SALE:** 5 Glengarry Weigh Feeders, 12" x 18", 50# hopper with hopper vibrator and bin-dicator, all switches and controls, 110 volt, 60 cycle. 4 Model GB4B and 1 Model BG4A. 2 Leominster Grinders, water cooled, 2½ H.P.—5 H.P., 220 volt, 60 cycle, 3 phase, including hoppers and stands. No reasonable offer refused for the above items. Nosco Plastics, Inc., P.O. Box 269, Erie, Pa.

**FOR SALE:** Buttondex Machines practically new. $200: Variety of Button compression molds in staple and fancy designs, perfect condition. Gas fired boilers, 2 H.P. Reply Box 2515, Modern Plastics.

**FOR SALE:** 8 Stokes "R" "DD2" and "RB2" Single Punch & Rotary Tablet Presses, vari-speed, motor driven. 2 Fitzpatrick Model "D" stainless steel Comminuting Machines with 7½ H.P. Motor. Abbe #00 Rotary Cutter 3 H.P. Motor. Powder Mixers, Sifters, etc. We are interested in your surplus machinery. The Machinery & Equipment Corp., 293 Frelinghuysen Ave., Newark, 12, N.J.

**FOR SALE:** 20" vacuum metalizing coater same as new with ionizer, extra electrode well, 2 extra rotary racks. Excellent for research and production. Price very reasonable. Reply box 2531, Modern Plastics.

**FOR SALE:** two Lester Injection Molding Machines. Type 3S-27-12—Serial #175 and #288. Both machines have extra heavy special design steel beams as top member of frame. Latest type internal heating cylinders. Overhauled by factory in past three years. Can be seen in operation. Ready for immediate delivery. Also, two auto-molders with an accumulator F. J. Kirk Molding Co., Inc., Clinton, Mass.

**FOR SALE:** 2-24 spindle spooler equipment mounted on frame and shuttle assembly for extruding monofilament, complete with dies, capstan, and 2 self-contained refrigerated cooling units. Spoolers individually motor driven. Made by Robbins Plastic Machinery Corporation. Reply Box 2510, Modern Plastics.

**FOR SALE:** 1½" to 6" Robbins Pipe Pull Off unit, 1 Pipe Coiling machine, 2½" to 2" Offset dies (6" body) complete with mandrels, bushings, and heaters. Equipment in original crates. Made by Robbins Plastic Machinery Corporation. Reply Box 2511, Modern Plastics.

**FOR IMMEDIATE SALE:** by leading New England molder, one 10D-8 oz. Reed Prentice injection press, ser. No. 38448; two C-1 DeMattia 12 oz. injection presses, 1953 series, with fully hydraulic clamp. Machines are in excellent condition and are fully equipped. May be inspected in operation. Reply Box 2530, Modern Plastics.

**FOR SALE:** Vacuum Metalizer 36". Injection Presses: 8, 12 oz. Reed. 4, 9, 16, 20 oz. HPM. 8 oz. Lester. 8 oz. vertical Giddings 6, 12 oz. Watson 2½ oz. Moslo mod. 72. 1, 2 oz. Van Dorn. Extruders; new 3" Bandera. Stokes Windsor Twinscrew RC 100. 3½" NRM oil heatd.—24", 30" Sheet Dies. 30", 52" Pull-Offs. 48" Sheet Stacker. 14", 36" Dulmage Meter Pumps. Despatch 48" x 72" Sheet Preheat Oven. Leominster 5HP Scrapgrinder.—Apex 2 color Container Imprint mach.—Compression Presses 50 to 600 T. Elmes Hydrolairpress 30 T. La Rose Champ & mod. 50 Electronic Preheaters. Stokes 280 G Preformpress.—Baker-Perkins 200 gal. Mixer. 42 cu. ft. Robinson Ribbon Mixer. 40 x 60" Vacuum Form. Mach. List your Surplus Equipment with me. Wanted: 50 T. Stokes Standard Comp. press. 24 oz 32 oz HPM or Watson. 1½ to 4½" Extruders. Justin Zenner, 823 Waveland Ave., Chicago 13, Ill.

*(Continued on page 256)*

PLASTIC MATERIALS FORMULATORS

*Samples Available*

•

*Inquiries Invited*

•

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CLAREMONT FLOCK

— CUSHION

YOUR THERMOSETS

AGAINST SHOCK!

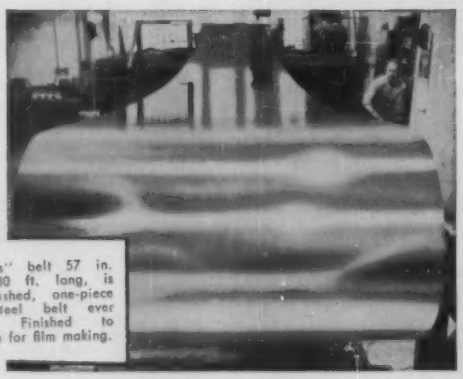
CLAREMONT WASTE MFG. CO.

CLAREMONT, NEW HAMPSHIRE

*The World's Largest Manufacturer of Plastic Fillers*

ENDLESS STAINLESS STEEL BELTS

Speed up Cooling—Setting—Conditioning of Sheets—film—coatings—laminated work



"Metalsmiths" belt 57 in. wide x 130 ft. long, is widest polished, one-piece stainless steel belt ever fabricated. Finished to mirror-polish for film making.

**Automatic Contact Gloss**

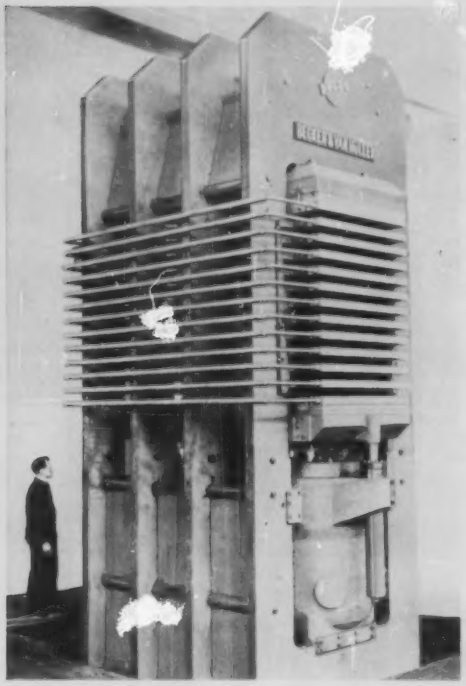
**Polished stainless steel belt provides high gloss as materials move through cooling and conditioning.**

Investigate continuous belt-processing for increased production and lower costs. One-piece, polished or unpolished, in any length and extra-wide sizes. Stainless steel (18-8) provides dense, corrosion-free surface. Width and camber controlled. Consult our engineers. Metalsmiths, 558 White St., Orange, N. J.

METALSMITHS STAINLESS STEEL

ENDLESS CONVEYOR BELTS

THIS IS NUMBER 3



● Certain proof of how their first two Becker & van Hüllen presses are performing is this *third* steel frame construction laminating press recently installed at Pioneer Plastics Corp., Sanford, Maine. It is ruggedly built and has the dependable hydraulics for which all Becker & van Hüllen presses are noted.

In the compression line Becker & van Hüllen builds every type and size of press. Please let us know what your requirements are.

**Sole U.S. Representative**

KARLTON

MACHINERY CORPORATION

210 E. Ohio St.

Chicago 11, Ill.

BECKER & VAN HÜLLEN

KREFELD GERMANY

(Continued from page 254)


# PLASTICS MACHINERY

**Cutters, Rotary, Plastic**
Cumberland #½ with 5 HP Motor
Ball & Jewell #1 with 10 HP MD
Ball & Jewell #2 with 40 HP MD, Extra Knives

**Extruders**
F. J. Stokes RC-100 Twin Screw Extruder, 10 HP V-S Drive
Hartig 3¼" Elec. Htd., 45" Barrel, 20 HP Reliance V-S Drive

**Injection Molding Machines**
2 Oz. Van Dorn, Oversize Cylinder, Model H-200
8 Oz. Reed-Prentice Double Link
16 Oz. Reed-Prentice No. 10-E-16, Elec. Htd., 1948

**Mills, Rubber/Plastic**
6" x 13" Lab Type with 5 HP MD
18" x 50" Farrel, Rubber/Plastic, 75 HP MD

**Presses, Molding**
15 Ton Baker Fully Automatic
15 Ton Stokes No. 200 D-2 Automatic (10)
15 Ton Dennison 12 Station Indexing Table, 10 HP MD Pump
30 Ton Baker Full Automatic Model 958, Excellent Condition, New 1951
40 Ton Francis, 4 Opening, 12" x 12" Elec. Heated Platens
50 Ton Stokes, Semi-Auto., Self Cont.
75 Ton Watson-Stillman Fully Automatic, 20" x 20" Platen 5 HP MD
100 Ton Stokes Standard Semi-Automatic, Power System, Timing Controls
100 Ton Lake Erie Hi-Speed, 24" x 24" Bed, 12" DLO, Self Cont.
113 Ton French Oil Mill, 6 Opening, Elec. Htd., Platens 15" x 18"
113 Ton R.D. Wood, 5-Opening Elec. Htd. Platens 14" x 20"
150 Ton Stokes Closure, Fully Automatic, 5 hp MD
150 Ton Stokes Standard Semi-Automatic, Power System, Timing Controls
175 Ton Viceroy Slab-Side 24" x 24", Elec. Htd. Platen with Hand Pump
200 Ton Stokes Semi-Automatic, Power System, Timing Controls
225 Ton Farrel 14" Ram x 18" Stroke, L-R 26½" x F.B. 24½" 7½ HP MD
300 Ton Stokes Semi-Automatic, Power System, Timing Controls
314 Ton Lake Erie 36" x 36" Semi-Automatic, Push Button Controls 10 HP Pump & Motor
625 Ton Farrel, Steam Platens 52" x 52", Pump, Mtr., Controls, Under Power
700 Ton Erie, Multi-Opening 42" x 42" Steam Platens
4000 Ton Mesta, 3 Upmoving 30" Rams x 20" Str. Bed 34" x 351"

**Presses, Hobbing**
400 Ton Robertson 13" Ram x 4" Stroke complete with pumps & 15 HP MD

**Furnaces and Ovens**
Megatherm, 3/60/220, 3 KW, 2-3 lb. Phenolic Per Min. (8)
Despatch Mdl. P1hd-8 8 Drawers, 12 x 18 x 2½" (2)

**Tablet Machines**
Model "E" Stokes, Complete with MD
Model R Stokes, Single Punch, Variable Speed Motor Drive, 3 HP
No. RB-2 Stokes, 16 Station, Motor Drive, 2 HP
Model 45 Defiance, 200 Ton, 15 HP, Vari-Speed, MD
Model F, Stokes, Single Punch, MD
No. 5 Arthur Colton, Motor Drive, 3 HP
No. DDS-2 Stokes, 23 Stations, US Vari-Drive, 10 HP
Model T Stokes Hydraulic Equalizer, MD

**Mixers**
Model "B" Banbury Lab type. Never used
No. 3A Banbury, 150 HP Md Rubber/Plastic
No. 3 Banbury 75 HP MD Excellent Condition Slide Door Construction

**Calenders**
24" x 48" Farrel-Birmingham, 3 Roll, 50 HP DC Motor
9" x 48" American Tool 4 Roll Doubling, Belt Drive
6" x 13" Elec. Htd. 4 Roll Lab Type, 7½ HP MD

**Pelletizers**
Mitts & Merrill Model 10-N-6 15 HP V.S. Drive

**Make Us Your Prime Source for All Types of Plastics Machinery**
Hydraulic Presses from lab size to 5,000 ton
Injection Molders from ¼ oz. to 60 oz. size
Extruders from lab size to 12"
Plastic & Rubber Mills and Calenders up to 84" size
Tablet Preform Presses, single punch and rotary, all sizes
Mixers all sizes, types and capacities

**Also a complete selection of tumbling barrels, take-up equipment, hydraulic power units, pumps, ovens, blenders, scrap cutters, pelletizers, coating equipment and laminating equipment.**

**JOHNSON MACHINERY Co.**
**683-P Frelinghuysen Ave., Newark, N.J.**
**What Do You Need? What Have You To Sell?**


## Machinery and equipment wanted

**WANTED:** 3½" NRM extrusion machine, A-1 condition only, give details on drive, hours used, price. Reply Box 2512, Modern Plastics.

**WANTED TO BUY:** One ball or pebble mill. Porcelain or high density lined. 750 to 1,000 gallons total capacity. Must be in good condition. Reply Box 2509, Modern Plastics.

**WANTED:** 50 ton Stokes, fully automatic molding machine, in good condition. State year and price. Morskil Company, 415 Lexington Avenue, New York, N.Y.

**MACHINERY WANTED:** (1) two roll Laboratory Mill, (6" or 8" x 12") (6" or 8" x 13") Used; for Rubber/Plastic; all accessories for complete unit. Steel rolls cored for oil heated circulation; range 375° F; 5 HP Motor 3/60/220. Reply Box 2505, Modern Plastics.

## Materials for sale

**PLASTIC SAMPLES:** molded plastic prototypes, no mold cost, 500-2000 pieces. Reply Box 2528, Modern Plastics.

## Materials wanted

**WANTED:**
Plastics Scrap and Rejects of all kinds. Ground and unground. Also rejected molded pieces and surplus virgin molding powders. Top prices paid.
Reply Box 2501, Modern Plastics.

**WANTED:**
Vinyl, polyethylene and styrene scrap for our manufacture of molding and extrusion compounds. We can use rigid from vacuum forming, lumps, bleeder, slabs, trimmings, rejects—anything suitable for reprocessing. Send samples and details or telephone. Steady buyers since 1940.
Rotex Rubber Company, Inc.
1-23 Jabez Street, Newark 5, N.J.
MArket 4-4444

**WANTED:** Clear Cellulose Acetate and other scrap from Vacuum Formers. Claude P. Bamberger, Inc. One Mount Vernon Street, Ridgefield Park, N.J. Telephone. HUbbard 9-5330.

## Molds for sale

**TOY INJECTION MOLDS FOR SALE:** These all steel molds, precision engineered, and in good condition, have been part of our toy line, but were discontinued when we decided to reduce the length of our line. We prefer selling these molds to foreign toy producers at a fraction of original cost.
President, Renwal Toy Corp., Mineola, N.Y.

**FOR SALE:** Typewriter Ribbon Box Mold, excellent running condition six cavity top and six cavity bottom. Cost $2300.00 will take $1200.00 cash. Samples on request. Reply Box 2522, Modern Plastics.

## Molds wanted

**MOLDS WANTED:** for component parts of plastic retractable ball point pen. Also interested in molds for small patented articles selling for less than $1.00 retail, and suited for super market or drug chain distribution. Nescor Products, 600 W. Harvey St., Philadelphia 44, Pa.

**WANTED:** Flower Pot Molds. MCI Plastics Corp., RD #1—Lakewood, N.J.

**WANTED:** Injection molds—one item or complete line of proprietary consumer articles, also interested in molds for industrial parts such as knobs, handles, fasteners, boxes, etc. Will consider purchasing complete injection plant with end products or parts line. Designers: New items wanted—cash or royalty. Victory Mfg. Company, 1722 West Arcade Place, Chicago 12, Ill.—Estab. 1930.

## Help wanted

**EXTRUSION SPECIALIST:** Man with knowledge of all phases of the extrusion field, including machine set-up, die, design, ability to handle people. Reply Box 2500, Modern Plastics.

**AGENTS:** Experienced plastics salesmen to sell our custom extrusions and vacuum formed parts. Full support from aggressive, capable company. Protected territory; some midwest open. Write for complete proposal: Quick Plastics, Box 66, Jackson, Michigan.

**CHEMIST:** Graduate chemist experienced in vinyl plastic compounding. Submit resume, including salary desired to: Research & Development Department, Nuodex Products Company, Elizabeth, New Jersey.

**POLYMER CHEMIST GROUP LEADER.** Immediate opening with progressive, research-thinking chemical company for a Polymerization Chemist. Should have 7 to 10 years experience in various phases of emulsion and suspension polymerization in rubber and surfactants with emphasis on formulation rather than basic research. Supervisory experience desirable. Wilmington location. Please send resume with salary requirements to: L. H. Snyder, Employment Manager, Atlas Powder Company, Wilmington 99, Delaware.

**MANUFACTURERS REPRESENTATIVES:** Opportunities with long established Eastern Extrusion Company expanding its lines in custom extrusion, heavy gauge sheet and injection molding. Openings in either or both lines in following areas: New England, Metro New York, Upper New York state, Ohio-Western Pennsylvania, Detroit. Prefer men handling allied non competitive lines. Straight commission—closed territory basis. Reply Box 2523, Modern Plastics.

**MANUFACTURERS' REPRESENTATIVE:** Rapidly expanding manufacturer of Injection Molding Machines seeking top flight sales organizations for representation in Detroit, Chicago, Cleveland, Western New York State, and surrounding areas. We are an old established United States firm long engaged in the manufacture of heavy equipment. Reply Box 2527, Modern Plastics.

(Continued on page 258)

# FOR SALE

**80 OZ. H.P.M.**
**INJECTION MOLDING PRESS**

- Serial No. 53-152
- Model 1200-H-80
- Daylight—60″
- Stroke—36″
- Shut Height 24″*

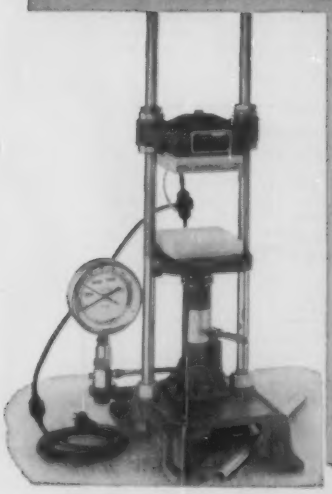
* Equipped with demountable spacer to reduce above by 12″

- Platen—60½ H x 68½ V
- Between rods 40½ H x 48½ V

**MINNESOTA PLASTICS CORP.**

45 E. Maryland Ave.,
St. Paul 3, Minn.

**The CARVER LABORATORY PRESS**



*...Solutions for Pressing Problems*

Accurately controlled pressures to 20,000 lbs.; 6-inch gauge mounted on base. Carver Standard Accessories include Electric or Steam Hot Plates, Carver Test Cylinders, Swivel Bearing Plates, Cage Equipment. Available from stock. Write for catalog.

**FRED S. CARVER INC.**
**HYDRAULIC EQUIPMENT**
3 CHATHAM ROAD, SUMMIT, N. J.

**IMS PURE**
# SILICONE FLUID
## MOLD RELEASE SPRAY

**EXCLUSIVE, FAST, ALL-METAL VALVE ENDS FUMBLING SAVES CYCLE TIME**

***Keeps Mold Lube Cost Down***

*It Isn't Size — It's Performance and Quality That Count!*

**PRICES** (Delivered)

| | |
|---|---|
| Sample Can | $2.00 |
| Per Unbroken Dozen | $18.00 |
| Per Unbroken Gross | $197.40 |

The Economical Way to Buy and Apply Pure, Costly Silicone Fluid!

**To Cover All Molding Conditions Keep Both Types on Hand**

**IMS PURE**
# ZINC STEARATE
## DRY POWDER SPRAY

**HANDY MOLD DUSTER**

**Quick—Convenient**

**Removable, Cleanable Spray Head Directs Dust Into Cavity Without Waste.**

**PRICES** (FOB Cleveland)

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|---|---|
| Sample Can | $2.00 |
| Per Unbroken Dozen | $13.80 |
| Per Unbroken Gross | $144.00 |

IMS Mold Releases are designed to bring you maximum quality and performance. Our Silicone Fluid Spray utilizes only more costly volatile Freon to minimize part marking on fast cycles. The Dry Powder Spray should be used in all applications where painting or plating follows the molding operation, also in preforming.

**INJECTION MOLDERS SUPPLY CO.**
3514 Lee Road • Cleveland 20, Ohio

(*Continued from page 256*)

**PLASTIC MOLD SUPERVISOR:** Wanted experienced man to take complete charge of old established mold shop in central Ohio, employing 10 men. Must be thoroughly experienced in designing and supervising the making of all types of molds. Reply Box 2525, Modern Plastics.

**WE WANT: A "REP" WHO IS "HEP"** to cover all of New England for us He will control all of the territory on an exclusive basis along with other non-competitive lines. We are a well-established producer and converter of metalized plastic sheetings which include acetate, polystyrene, butyrate and mylar. Reply Box 2518, Modern Plastics.

**MANUFACTURERS' REPRESENTATIVE WANTED:** An old established manufacturer, rated AAA1, specializing in mass production custom made items for industry particularly where they involve the decorating arts, has opportunity for successful and established manufacturers' representative, on commission, in various areas throughout the United States. The unusual part about this opportunity is that we supply a completed service, i.e. everything from design to completed product assembly including plastic, metal stampings and die castings. Give a complete history of your background in first letter. Reply Box 2513, Modern Plastics.

**INJECTION MOLD DESIGNER.** Attractive opening in molding plant for qualified engineer, experienced in the design and development of molds and fixtures for high volume production of acylics, nylons, and cellulosics. . . . Applicant should be a graduate engineer or equivalent with several years of experience in this field. Excellent opportunity for advancement. Send resume to:

FORD MOTOR COMPANY
Salaried Personnel
2 Stewart Street
Ypsilanti, Michigan

**SCULPTOR:** Must be in the 25-35 year age bracket. At least two years of college required. Three years or more in wax, clay or plastic modeling experience and background necessary, preferably in shoe or doll designing. For a confidential interview, send a resume of your education and experience to: Bata Shoe Company, Inc., Belcamp, Maryland.

**MANUFACTURER'S REPRESENTATIVE:** Nylon-Industrial Injection Molding. Nylon molder in Midwest desires representation in major industrial areas outside of Chicago. This molder specializes in precision applications and has a record of experience with many different parts; having produced several hundred million nylon parts in past few years. Reply Box 2514, Modern Plastics.

**EXTRUDER OPERATOR:** For brand new thermoplastic sheeting line. Experience necessary. Northern New Jersey location. All inquiries held confidential. Reply Box 2521, Modern Plastics.

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**WANTED:** Man who knows all phases of vinyl extrusion field. Machine set-up, Die Design & etc. Reply to D. M. Temple, 152 S.E. 9th Ct., Hialeah, Florida

**CHEMICAL ENGINEER:** BS Degree required. Must have plant experience and background in plastics and resins, preferably in slush molding testing and research. Available position is for application, development and evaluation of polyvinylchloride slush molding and injection molding Research and Development. For a confidential interview, send a resume of your education and experience to: Bata Shoe Company, Inc., Belcamp, Maryland.

**MECHANICAL ENGINEER** for Boat Development Projects; Small boat experience desirable, but not essential. Excellent opportunities for a qualified man. Send complete resume to: R. F. Fee, Personnel Director, Winner Manufacturing Co., Inc., Trenton 3, N.J.

**WANTED:** Sales Representatives for plastics and/or rubber working machinery. Exclusive line of high quality machines for all phases of these industries. Manufactured by established concern. Full protection and exclusive territories. High commission basis only. District managership possibilities. Permissible to have other non conflicting representations. Reply Box 2502, Modern Plastics.

**STAKE YOUR CLAIM** in the "Foam Of The Future" Polyester-Polyurethane Foam. Foremost manufacturer's increased production presents unusual opportunity for profits now—and ever-increasing future profits—to a selected few salesmen and distributors with ability, experience, responsibility and organization to capitalize on its potential.
Polyester-Polyurethane Foam is one of the most versatile materials of the century. It is now selling in volume to manufacturers of diverse products requiring cushioning, and thermal, sound, shock, electrical or electronic insulation. Don't miss this rare opportunity. Write, giving full details regarding organization, background, experience, territory, etc. Reply Box 2503, Modern Plastics.

## Situations wanted

**REINFORCED PLASTICS ENGINEER:** Fully experienced in design, development and all methods of reinforced polyester application; customers contact. Seeking adequate position. Reply Box 2516, Modern Plastics.

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**PLANT MANAGER:** Thoroughly familiar with all phases of Injection Molding; with background of engineering, inventory and cost control, and quoting. Have been in Plastics for 16 years with experience in appliance and automotive production. Will forward resume of work experience and will arrange for personal interview. Presently General Manager of Injection Molding plant in Midwest. Owners of plant know about this advertisement. Reply Box 2529, Modern Plastics.

**ENGR. MANAGER:** Young Chem.E., thorough knowledge of Fiberglass Reinforced Plastics. Capable of setting up and running plant or dept. to produce large or small parts. Engineering, direct supervision and management experience. Estimating, planning, development and production utilizing all major molding types plus fabrication and assembly procedures. Reply Box 2524, Modern Plastics.

**MANUFACTURER'S REPRESENTATIVE:** New England States. Covering Institutions, Housing Developments, Industrial Plants & Jobbers—Steady exhibitor at related conventions—wants plastic items for this market. Send us details of your products, and we shall arrange for further discussion. Joseph F. Dumais Company, P.O. Box 257, South Swansea, Mass.

**EXTRUSION: ME,** experienced polyethylene film, custom extrusion production and design. Seek position, N.Y., N.J., metropolitan area. Reply Box 2532, Modern Plastics

**EXECUTIVE SALES:** Administrative Assistant in plastic industry. Merchandising experience with National Retail organization. Six years with Mfg. Co. as buyer of custom parts, Plastics, Vinyls, Rubber, Specialty items. College Degree, 44 years old, will relocate. Reply Box 2520, Modern Plastics.

**JOB WANTED:** One or two days per week on permanent basis. At present technical director multi-plant AaA-1 company division operating in nonferrous foil rolling, extrusion, coating, laminating. Metals, papers, films, adhesives, inks. Containers, structural, and electronics. Chemical and metallurgical. Classified and commercial. Reply Box 2506, Modern Plastics.

**INJECTION MOLDING FOREMAN:** 8 years experience Reed & H.P.M. All repairs including some welding. Presently employed by medium sized custom molding shop in N.Y. area. Will relocate anywhere including foreign country. Reply Box 2504, Modern Plastics.

**POSITION WANTED:** Engraver and Die Sinker for small dies. Over 40 years experience. State hourly and overtime wage scale. Reply Box 2517, Modern Plastics.

## Miscellaneous

**DESIGN PATENT:** For House number mounted on Acrylic, Aluminum Frame, good proprietary item for shop large or small. Have some tools for same. Will release on Royalty after a small down payment. For detail contact, Edmund F. Reynoso, 29 Colonial Way, San Francisco, Calif.

**USE OUR FACILITIES TO STERILIZE** laboratory test or package any plastic product. 84 cu. ft. rectangular bulk sterilizer, complete bacteriological laboratory with animal test room, packaging equipment and personnel can all be arranged for availability. Contact Sterilon Corporation, 500 Northland Avenue, Buffalo 11, New York for full information.

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For further information address Classified Advertising Department,

Modern Plastics, 575 Madison Avenue, N. Y. 22, N. Y.

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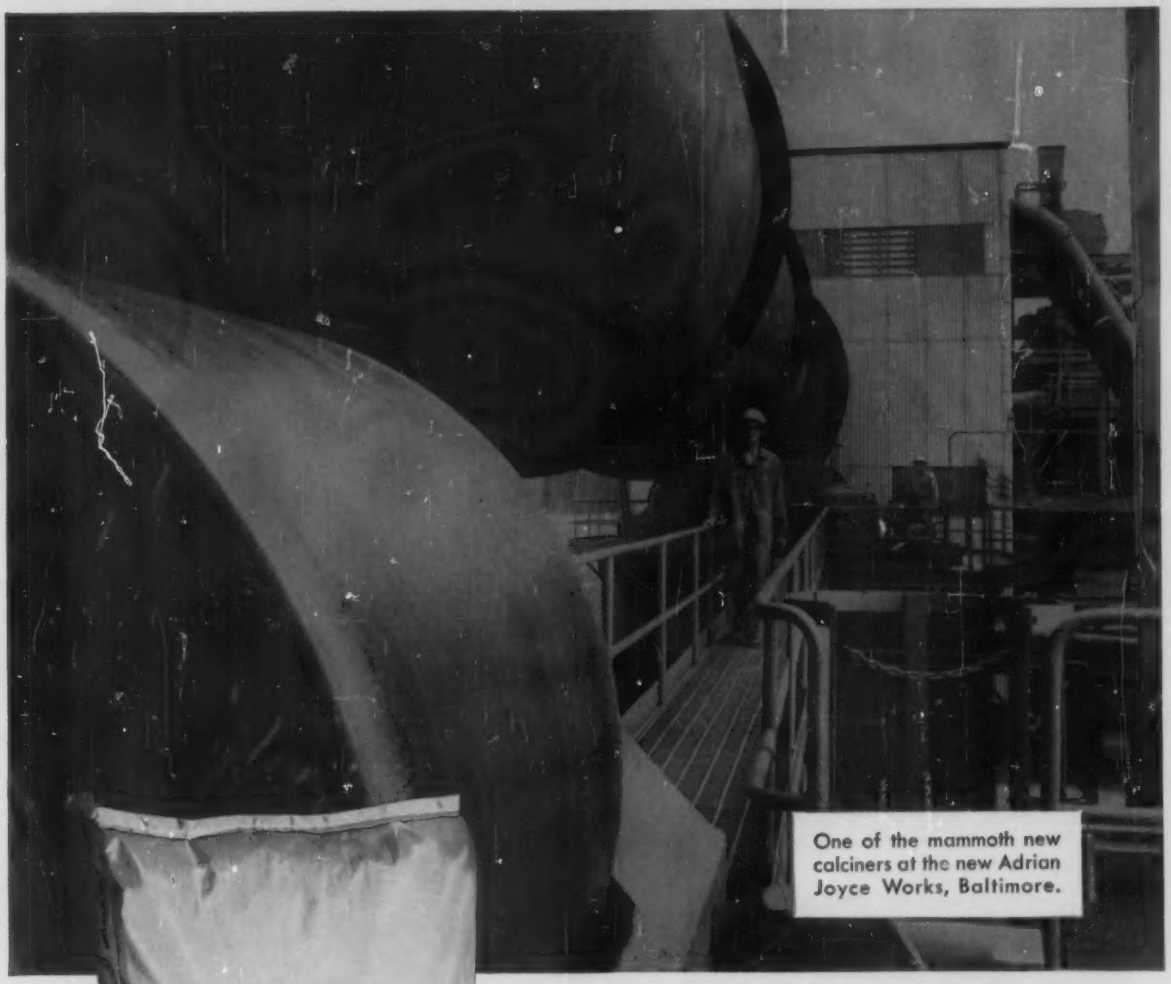

One of the mammoth new calciners at the new Adrian Joyce Works, Baltimore.

# ZOPAQUE®
## TITANIUM DIOXIDE

***... the whitest white pigment available!***

You can count on Glidden to supply your complete titanium dioxide requirements. Our new Adrian Joyce Works at Baltimore more than doubles the available supply of *Zopaque* Titanium Dioxide. Further plant expansions are now being made to help meet your growing needs in the years to come!

***Zopaque gives you these advantages:***

- Highly accelerated dispersion rate.
- Exceptional hiding power.
- Outstanding gloss and color retention.
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- Rutile and Anatase grades.

*By the makers of SUNOLITH Lithopones and EUSTON White Lead*

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U.S.I.

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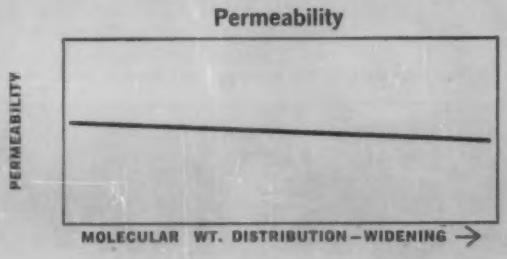
# POLYETHYLENE PROCESSING TIPS

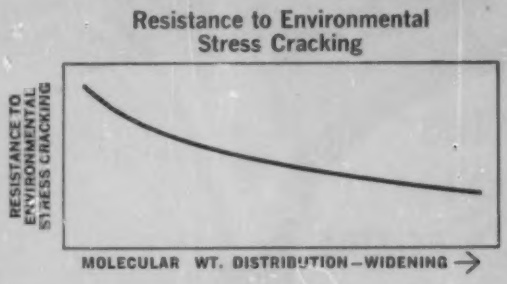
## HOW MOLECULAR WEIGHT DISTRIBUTION AFFECTS POLYETHYLENE PROPERTIES

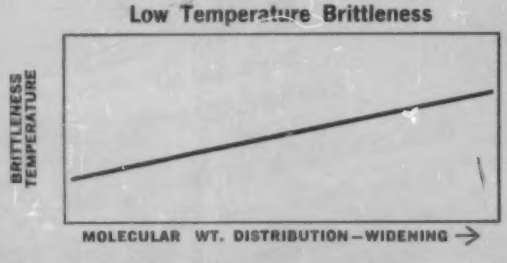
MOLECULAR WEIGHT DISTRIBUTION is one of three basic characteristics that determine the properties of articles made of polyethylene. MOLECULAR WEIGHT and DENSITY are two others.

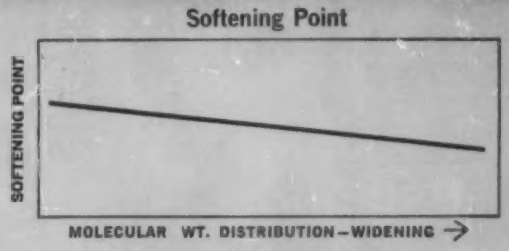
Any polyethylene resin contains molecules of many different sizes. Molecular weight distribution is a measure of how widely these sizes vary from the average.

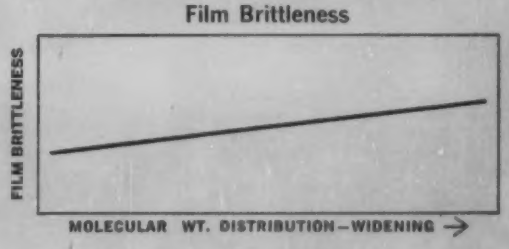
The following graphs show the effects of widening MWD, assuming density and molecular weight remain unchanged. In aiming for specific end properties, of course, all three characteristics must be taken into account, as all can be varied.

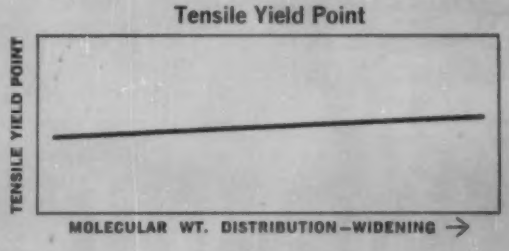


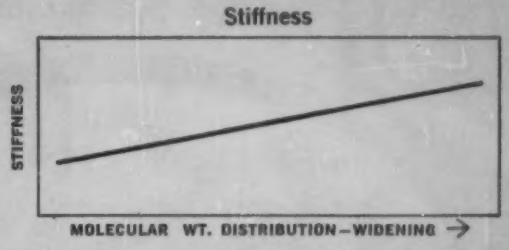


Resistance to Environmental Stress Cracking
RESISTANCE TO ENVIRONMENTAL STRESS CRACKING
MOLECULAR WT. DISTRIBUTION—WIDENING




U.S.I. "Tips" covering the effects of density, molecular weight and molecular weight distribution have now appeared make a handy reference guide. To receive just ask for back issues of "Polyethylene Processing Tips."

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MODERN PLASTICS

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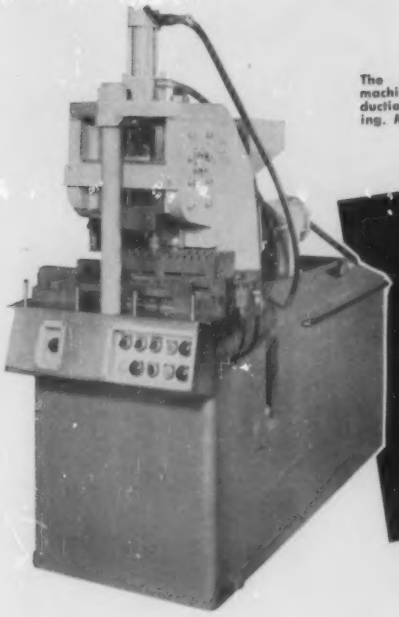

The Moslo DUPLIMATIC—2½ ounce machine designed for high speed production of cord plugs and insert molding. Molds all Thermo-Plastic materials.

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## Out-produce other machines with TWICE the rated capacity

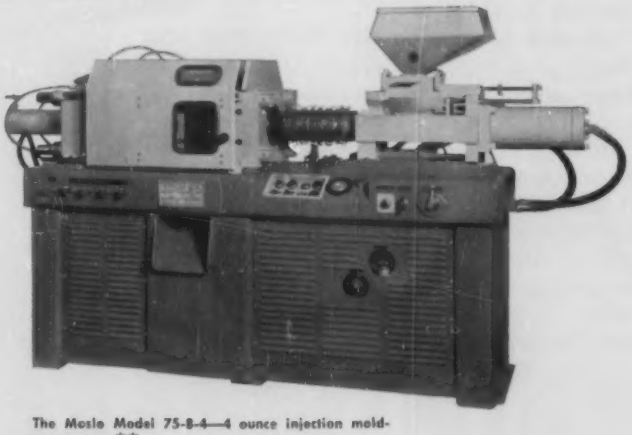
**It may sound unbelievable, but it is a fact that Moslo injection molding machines turn out twice the production of similar competative machines.**

**Moslo machines are equipped with the latest automatic controls and safety features, are ruggedly constructed for years of continuous running, and operate at speeds that make *production profitable*.**

**To appreciate fully how a Moslo machine can benefit you, write for complete specification material.**

**Better yet, make a visit to our headquarters and we will arrange a demonstration using your own molds.**

The Moslo Model 74-7-2—2 ounce injection molding machine**



The Moslo Model 75-8-4—4 ounce injection molding machine**

*Hydraulic pull-back for plasticizing assembly is optional equipment on 2 ounce model and standard equipment on Model 75.

**2 and 4 ounce machines available with long stroke clamp for deep-draw work as optional equipment.

**MOSLO—The Name for the world's fastest Molding Machines**

# MOSLO MACHINERY COMPANY

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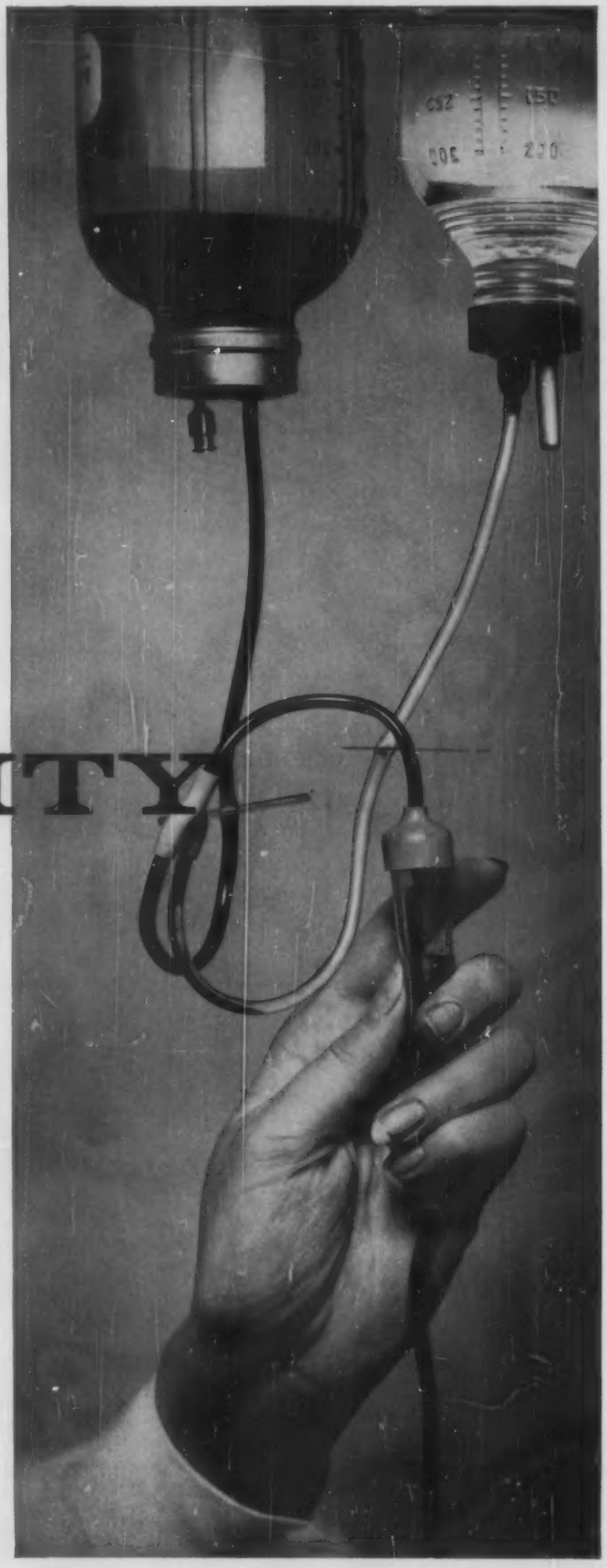

*A word about Diamond* PVC *resin*

# CLARITY

DIAMOND PVC produces films and extrusions of exceptional quality, uniform color and gloss. This top-quality resin has fine heat stability and dry blends rapidly.

Blended compounds flow freely, even after shipping or storage, because DIAMOND PVC mixes smoothly with plasticizers, stabilizers and lubricants.

DIAMOND PVC's other advantages—speed, economy, uniformity—spell easier processability and top-grade products like the blood transfusion tube at the right.

For information and technical help on processing problems, call your DIAMOND sales office. Or write DIAMOND ALKALI COMPANY, 300 Union Commerce Bldg., Cleveland 14, O.

**Diamond Chemicals**

*19' Fiberglas Caribbean Cruisette by Lone Star Boat Co.*

# *Smooth Sailing*—Enjoy it in your Polyester Resin Production, too!

From sleek power boats to colorful, fire-resistant building panels, your polyester resin customers are creating an ever-growing list of new and better products for the American consumer. As the demand for these better-looking, stronger, more durable polyester products expands, you'll be called upon to supply increasing amounts of high purity resins.

You'll discover several important advantages in making your polyester resins from Pittsburgh Phthalic and Maleic Anhydride. As a basic producer, Pittsburgh offers you materials that are quality-controlled from coal to container. The uniform purity of Pittsburgh P.A. and M.A. minimizes your quality control needs and eliminates many production problems. Pittsburgh Phthalic is virtually a water-white product, enabling you to produce practically colorless resins which have good light transmission and which can be pigmented in a wide range of colors.

Pittsburgh's modern new Phthalic Anhydride plant—which doubles our output—is now in full production! You can rely on prompt on-schedule deliveries, in any form or quantity you need. *For more information, call or wire for the services of a Pittsburgh Industrial Chemicals man.*

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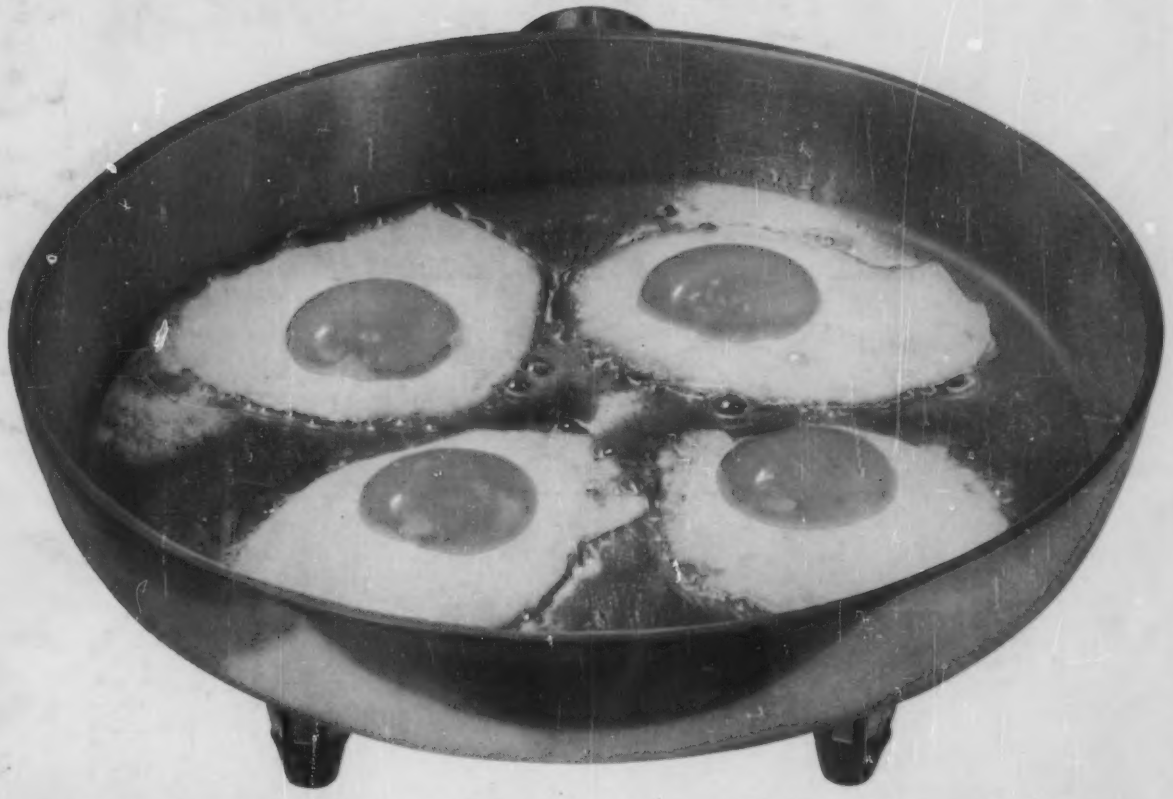
# THE HANDLE OF TOMORROW GOES HERE!



Designers of tomorrow's appliances are writing their specifications today — and they call for better performance, better appearance, of molded parts than ever before. Industrial applications, too, demand higher quality in molded components than most present-day plastics can give.

Two new phenolic compounds from G. E. are expressly engineered to meet these exacting demands. *G-E 12980*, with heat resistance of 500°F and rich, satin-smooth finish for greater sales appeal, is ideally suited to utensil handles and similar appliance parts. *G-E 12981* has medium heat resistance (400°F) and somewhat higher strength than *G-E 12980*. It is recommended for industrial applications where these properties are desirable. Both compounds feature low gravity, good dimensional stability, fast preheat and cure.

Write for samples and complete technical information on these newest additions to the G-E phenolics line. GENERAL ELECTRIC COMPANY, Chemical Materials Dept. Section MP-8, Pittsfield, Mass.

*Progress In Phenolics*

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